DOCUMENT RESUME

ED 122 018 CE 006 860

AUTHOR	Branson, Robert K.; And Others
TITLE	Interservice Procedures for Instructional Systems Development. Phase I: Analyze.
INSTITUTION	Florida State Univ., Tallahassee. Center for Educational Technology.
SPONS AGENCY	Naval Education and Training Command, Pensacola, Fla.
PUB DATE	1 Aug 75
CONTRACT	FSU-N61339-73-C-0150
NOTE	318p.; Figures I.19 and I.24, and the Glossary will not reproduce well due to quality of original; For related documents, see CE 006 861-864
EDRS PRICE	MF-$0.83 HC-$16.73 Plus Postage
DESCRIPTORS	Educational Development; Educational Needs; Educational Programs; *Instructional Systems; *Job Analysis; Job Training; *Military Training; Performance Criteria; *Program Development; *Systems Development; Task Performance; Training Objectives
IDENTIFIERS	*Instructional Systems Development; ISD

ABSTRACT

The document is the first of a five-part series focusing in minute detail on the processes involved in the formulation of an instructional systems development (ISD) program for military interservice training that will adequately train individuals for a particular job. The Analyze phase consists of five steps, diagrammed by flow charts. The first step, Analyze Job, establishes what constitutes adequate on-the-job performance, focusing on what tasks, performed in what manner, under what conditions, in response to what cues, and to what standards, make up the job. The second step, Select Tasks/Functions, focuses on the selection of tasks that need training and those that do not in order to ensure some form of instruction for important tasks. The third step, Construct Job Performance Measures, provides measures to test whether individuals are performing their tasks. The fourth step, Analyze Existing Courses, presents procedures for reviewing the documentation of how existing courses were developed and validated and to determine whether the methods used are likely to have produced a course that will meet present training needs. The fifth step, Select Instructional Setting, focuses on providing adequate and appropriately timed training resources. A list of references, glossary, and index are included. (Author/EC)

Documents acquired by ERIC include many informal unpublished materials not available from other sources. ERIC makes every effort to obtain the best copy available. Nevertheless, items of marginal reproducibility are often encountered and this affects the quality of the microfiche and hardcopy reproductions ERIC makes available via the ERIC Document Reproduction Service (EDRS). EDRS is not responsible for the quality of the original document. Reproductions supplied by EDRS are the best that can be made from the original.

ED122018

Contract Number N61339-73-C-0150

INTERSERVICE PROCEDURES FOR INSTRUCTIONAL SYSTEMS DEVELOPMENT

PHASE I: ANALYZE

J. Lamarr Cox
Gail T. Rayner
Robert K. Branson, Principal Investigator

Center for Educational Technology
Florida State University
Tallahassee, Florida 32306

1 August 1975

Prepared for:

The Interservice Committee for Instructional Systems Development
Worth Scanland, Chairman
Naval Education and Training Command
Pensacola, Florida 32508

The President
U.S. Army Combat Arms Training Board
Fort Benning, Georgia 31905

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CE006960

PHASE I: ANALYZE

TABLE OF CONTENTS

BLOCKI.1: ANALYZE JOB 1

Introduction 2

Procedures 34

Outputs 83

BLOCK I.2: SELECT TASKS/FUNCTIONS 113

Introduction 114

Procedures 117

Outputs 148

BLOCK I.3: CONSTRUCT JOB PERFORMANCE MEASURES 156

Introduction 157

Procedures 166

Outputs 209

BLOCK I.4: ANALYZE EXISTING COURSES 213

Introduction 214

Procedures 218

Outputs 227

BLOCK I.5: SELECT INSTRUCTIONAL SETTING 230

Introduction 231

Procedures 244

Outputs 262

REFERENCES 266

GLOSSARY 278

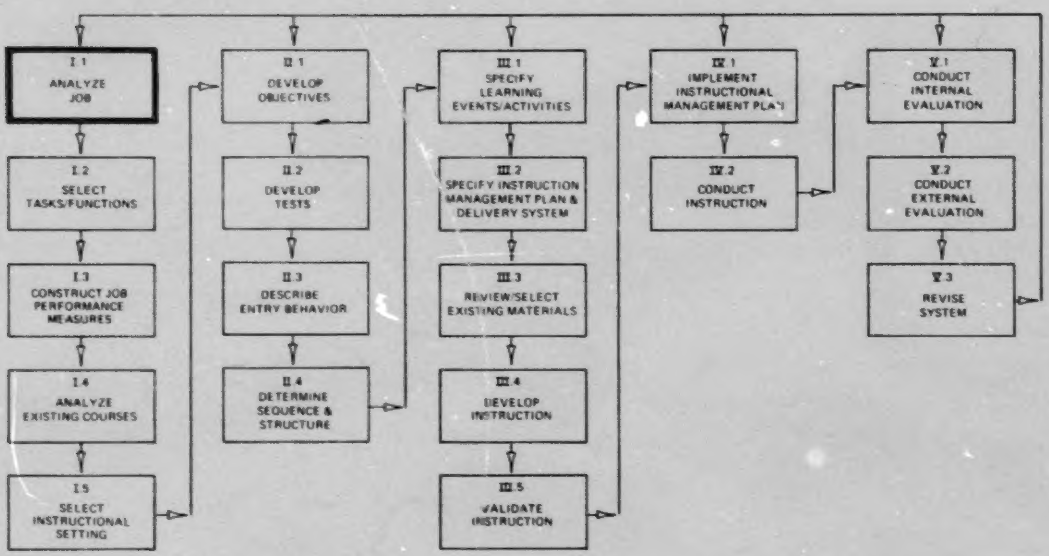
INDEX 303

ACKNOWLEDGEMENTS

Substantial contributions to this volume of the Interservice Procedures for Instructional Systems Development were made by: James Sherrill, Dr. Raymond Christal, Dr. C. L. John Legere, Dr. Walter Driskill, Major Edgar D. Maddox, and Dr. Robert Swezey.

Special acknowledgements for their work on this volume go to: Walter Eberl, Kenneth Epstein, M. C. Mitchell, Robert Spillane, Douglas Farrow, Linda Morse, Frank Rushton, Dr. Barbara Johnson, Dr. Charles Jackson C. C. Jeter, the Air Force Human Resources Laboratory, Lackland AFB, Texas, and the Combat Arms Training Board, Fort Benning, Georgia.

BLOCK I.1: ANALYZE JOB


I.1 ANALYZE JOB
I.2 SELECT TASKS/FUNCTIONS
I.3 CONSTRUCT JOB PERFORMANCE MEASURES
I.4 ANALYZE EXISTING COURSES
I.5 SELECT INSTRUCTIONAL SETTING
II.1 DEVELOP OBJECTIVES
II.2 DEVELOP TESTS
II.3 DESCRIBE ENTRY BEHAVIOR
II.4 DETERMINE SEQUENCE & STRUCTURE
III.1 SPECIFY LEARNING EVENTS/ACTIVITIES
III.2 SPECIFY INSTRUCTION MANAGEMENT PLAN & DELIVERY SYSTEM
III.3 REVIEW/SELECT EXISTING MATERIALS
III.4 DEVELOP INSTRUCTION
III.5 VALIDATE INSTRUCTION
IV.1 IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN
IV.2 CONDUCT INSTRUCTION
V.1 CONDUCT INTERNAL EVALUATION
V.2 CONDUCT EXTERNAL EVALUATION
V.3 REVISE SYSTEM

OVERVIEW

Development of an instructional program is begun because no training program has been found to exist that is capable of adequately training individuals to do a particular job. This first step in the ISD process, then, is to establish exactly what constitutes, or will constitute, adequate on-the-job performance. It answers the questions of what tasks, performed in what manner, under what conditions, in response to what cues, to what standards of performance, make up the job. Regardless of how well the next steps are carried out, if job analysis data are not valid and reliable, the resulting instructional program will fail to produce personnel able to perform their duties at an acceptable level.

ANALYZE JOB

1.0 INTRODUCTION

1.1 How An Instructional Systems Development Program Begins

Where a particular Instructional Systems Development (ISD) program begins depends on what has been done before. For example, if you or someone else recently completed an adequate job analysis of the particular job for which you intend to provide an ISD training program, you should not begin with this block. While this is an excellent point at which to begin learning about ISD, it is not necessarily the point at which you would begin developing an ISD program.

The ultimate purpose of ISD is to produce a properly trained person; that is, a person who can do the job for which he was trained. This means that in order to design and carry out effective training you first must know the job in considerable detail. The ISD process begins with specific questions about the job.

Some of the things you must find out about the job in order to develop adequate training are:

1. What kinds of people will be doing this job? How many will be doing the job? Where will they be located?
2. What major duties does the job include?
3. What tasks make up the job?
4. Exactly how is each task accomplished? What work elements make up the task? In what order must these be performed?

5. Under what conditions must each task be performed? What tools, equipment, or other facilities are required to perform each task?
6. What cues cause a job incumbent (job holder), in the job situation, to perform a particular task in a particular manner? (How does he know when to start a task, when to perform each element that makes up the task, and when the task is completed?)
7. To what standard of proficiency must each task be performed?

Requirements for trained people originate from a number of sources:

1. Introduction of new weapons and systems
2. New laws, Department of Defense (DOD) requirements, military service specific needs, and social problems
3. Realignment of career fields, ratings, Military Occupational Specialties (MOS), or Air Force Specialties (NOTE: Hereafter, when referring to specialties in all services, the term Defense Occupational Specialty (DOS) will be used.)
4. Quality control reports indicating a training need that is not being adequately met

While training needs can and will arise from any and all of these sources, the first step in the ISD process is to identify the discrepancy that exists between whatever training is being given at the present time and the training that must be given to satisfy the manpower need. Discovery of this discrepancy begins by asking the question: Does anyone do the job now?

If the answer is "yes," a second question is: Is there now a training program for this job?

If the answer to both questions is "yes," you will have to look further to discover the discrepancy. Further questions and procedures are outlined in Block I.4: ANALYZE EXISTING COURSES. These will assist you in determining the exact location of the discrepancy in the existing training program. In the ISD model, finding the first discrepancy indicates only where you should begin. Finding and correcting the first discrepancy probably will not result in an acceptable training program, but instead most likely will require a series of changes that will affect every part of the program.

If the answer to both questions is "yes," you should begin the actual ISD process at Block I.4: ANALYZE EXISTING COURSES. However, the ISD approach to analyzing existing courses requires a clear understanding of the steps outlined in Blocks I.1, I.2, and I.3. Therefore, unless you are certain you already have that clear understanding, the best place to begin learning about the ISD process is here in Block I.1.

If the answer is "no" to either of the above questions (that is, if no one does the job now or no training programs for the job exist), you have found the discrepancy. In the first case, where no one does the job now, the job undoubtedly is just being created because of some new or modified system or equipment. A discrepancy is certain to exist between the ability of existing courses to effectively and efficiently train personnel, and the training requirements of an as yet undefined new job. In the second case, where there is no existing training program, there is certain to be a discrepancy between the ability of a non-existent course to provide adequate training and the training requirements of either a new or existing job. Therefore, the correct place to begin in the ISD process is to analyze the job to determine exactly what the job holder must do when he does the job right. This is the foundation for all sound training programs. If this step is not done and done well, there will be no basis for development of effective, efficient instruction.

Some of the outputs of this block are:

1. A validated list of tasks that make up the particular job being analyzed.
2. Conditions under which each task must be performed, cues that initiate performance of the task, and standards to which each task must be performed.
3. Details of how each task is performed; that is, a listing of the work elements that make up each task.

In the next block, Block I.2: SELECT TASKS/FUNCTIONS, a decision will be made as to which tasks will be trained and which tasks will not be trained. In Block I.3: CONSTRUCT JOB PERFORMANCE MEASURES, Job Performance Measures (JPM) will be developed to determine whether someone is capable of doing the job. This step may require inputs from some of the same people who provided inputs in one or both of the two preceding blocks. These facts lead to critical questions:

1. Why waste time and money in Block I.1 getting information on conditions, standards, and elements for tasks that, in Block I.2, you may decide not to train?
2. If you have to make a long, expensive trip to get job information in Block I.1, why make the same trip again in Block I.3? Why not get all the information while you are there?

3. Since you probably will use a questionnaire to validate your task list in Block I.1, and since you also will use a questionnaire with basically the same people to gather information for making the selection decision in Block I.2, why not do both with the same questionnaire?

A single answer should satisfy all of the above questions. The order in which you carry out the steps outlined in Blocks I.1, I.2, and I.3 depends largely on the type of job analysis you intend using and on economic considerations. Certainly you cannot develop Job Performance Measures for tasks selected for training until you select tasks for training. Nor can you select tasks for training until you know what the tasks are from which you are to choose. Other than such obvious, logical restrictions, the ISD process does not restrict you to a specific job analysis approach or to a specific sequence of steps in carrying out the requirements of the first three blocks in the model. The only requirement is that your approach be well-planned, logical, and consistent with the needs and resources of your command.

1.2 Definition of Job Analysis Terms

Already in this introduction, we have used some terms that many people use to mean different things. It is essential that those involved in ISD define such terms as job, duty, task, and element in the same way. Since one of the purposes of analyzing jobs is to provide information for developing instruction, there must be clear communication between the ones who analyze the job and the ones who use the job analyst's findings as a basis for developing instruction. Because of this, we will spend some time here defining job analysis terms and pointing out how the terms can be effectively used to describe exactly what a person does when he does his particular job right. Figure I.1 illustrates the relationship between the several layers of a job breakdown. Further examples will be given later in this section.

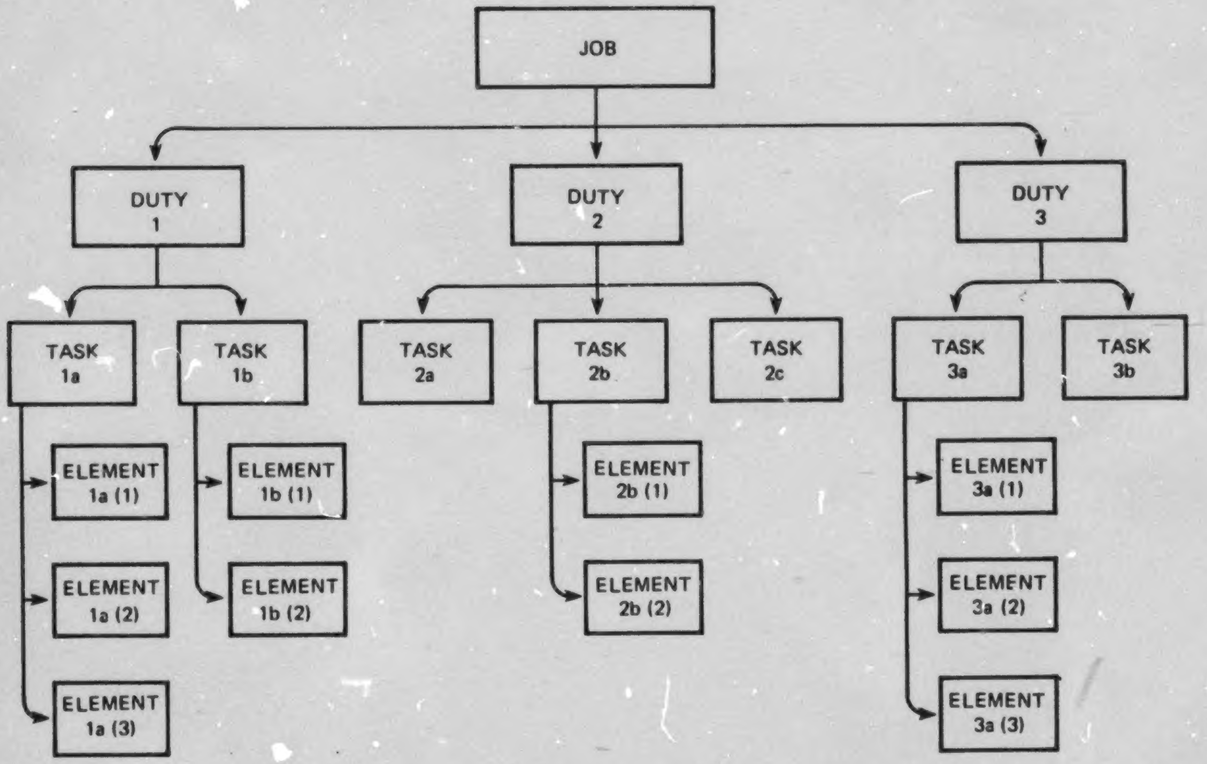


FIGURE I.1: Interrelationships of Job, Duties, Tasks, and Elements

1.2.1 Job

The duties and tasks performed by a single worker constitute his job. If identical duties and tasks are performed by several individuals, they all hold the same job.

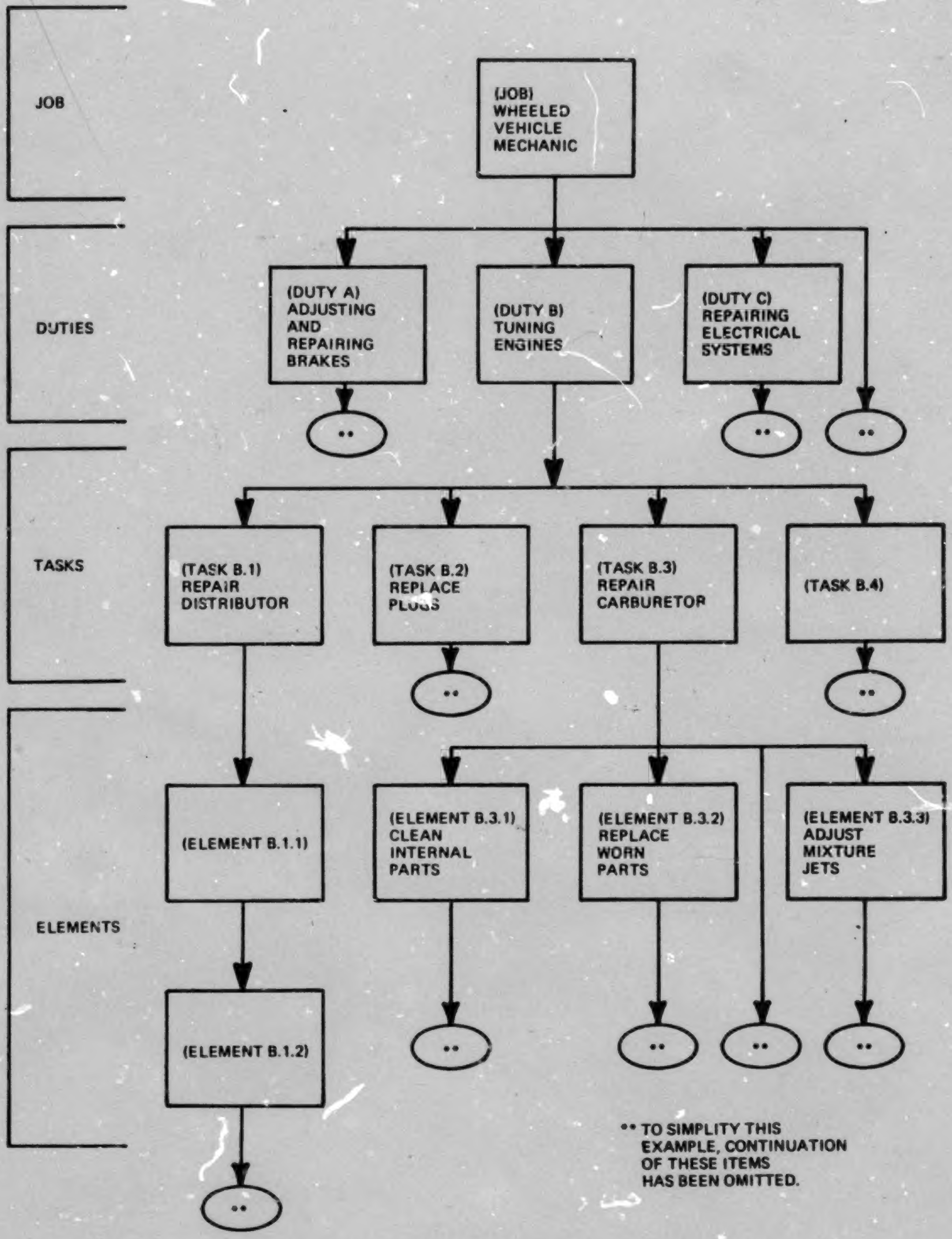
The job is the basic unit used in carrying out the personnel actions of selection, training, classification, and assignment. In the Army and Marine Corps, such groupings or jobs are defined as Military Occupational Specialties (MOS). In the Air Force, they are defined as Air Force Specialties (AFS), while the Navy defines them as ratings. These Defense Occupational Specialties (DOS) form the occupational basis of the services' personnel management system. That is, they identify work requirements and individual qualifications, facilitate assignment and distribution of personnel, provide for trained replacements, and facilitate more accurate estimates of force requirements.

Some examples of jobs are:

EXAMPLES

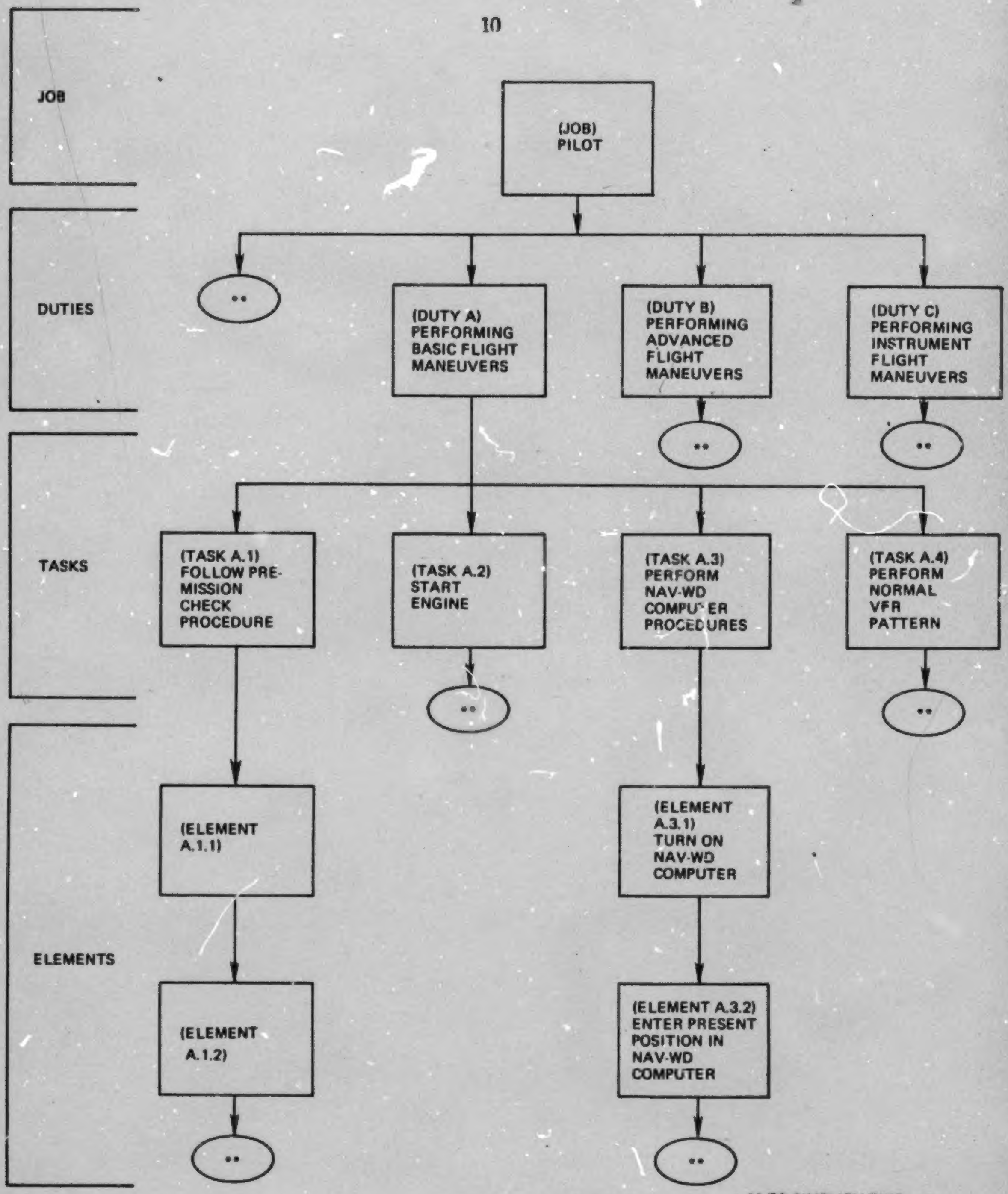
1. Wheeled vehicle mechanic
2. Administrative officer
3. Pilot of jet aircraft
4. Electronic equipment repairman
5. Military policeman
6. Fire chief

The relationship between several of these job examples and their related work activities is shown in Figures I.2 and I.3.


JOB
DUTIES
TASKS
ELEMENTS
(JOB) WHEELED VEHICLE MECHANIC
(DUTY A) ADJUSTING AND REPAIRING BRAKES
(DUTY B) TUNING ENGINES
(DUTY C) REPAIRING ELECTRICAL SYSTEMS
(TASK B.1) REPAIR DISTRIBUTOR
(TASK B.2) REPLACE PLUGS
(TASK B.3) REPAIR CARBURETOR
(TASK B.4)
(ELEMENT B.1.1)
(ELEMENT B.1.2)
(ELEMENT B.3.1) CLEAN INTERNAL PARTS
(ELEMENT B.3.2) REPLACE WORN PARTS
(ELEMENT B.3.3) ADJUST MIXTURE JETS
••

•• TO SIMPLITY THIS EXAMPLE, CONTINUATION OF THESE ITEMS HAS BEEN OMITTED.

FIGURE I.2: The Job of Wheeled Vehicle Mechanic


JOB
DUTIES
TASKS
ELEMENTS
(JOB) PILOT
**
(DUTY A) PERFORMING BASIC FLIGHT MANEUVERS
(DUTY B) PERFORMING ADVANCED FLIGHT MANEUVERS
(DUTY C) PERFORMING INSTRUMENT FLIGHT MANEUVERS
**
**
(TASK A.1) FOLLOW PRE-MISSION CHECK PROCEDURE
(TASK A.2) START ENGINE
(TASK A.3) PERFORM NAV-WD COMPUTER PROCEDURES
(TASK A.4) PERFORM NORMAL VFR PATTERN
**
**
(ELEMENT A.1.1)
(ELEMENT A.3.1) TURN ON NAV-WD COMPUTER
(ELEMENT A.1.2)
(ELEMENT A.3.2) ENTER PRESENT POSITION IN NAV-WD COMPUTER
**
**

** TO SIMPLIFY THIS EXAMPLE, CONTINUATION OF THESE ITEMS HAS BEEN OMITTED

FIGURE I.3: The Job of a 7D Pilot

1.2.2 Duty

A duty is one of the major subdivisions of work performed by one individual. A job is made up of one or more duties.

The following are some of the characteristics of duties:

1. A duty is one of the job incumbent's main functions. It sometimes may be a particular job incumbent's total job.
2. A duty is a grouping of closely related tasks.
3. Duty requirements often are the basis for initial assignment to a job, for determining the qualifications required to perform in the job, or for determining requirements for post-assignment training.

Duties can usually be defined by asking a supervisor what he thinks are the 5 or 6 most critical factors of a job or what he would demand of a person being considered for a job. In the case of a clerk/typist, for example, he may say, "(1) Ability to operate equipment, (2) ability to route correspondence, (3) ability to maintain files, and (4) ability to prepare correspondence." The job of clerk/typist, even after exhaustive analysis, probably will be found to consist of four duties, i.e., OPERATING equipment, MAINTAINING files, ROUTING correspondence, and PREPARING correspondence.

Selection of duty titles often is somewhat arbitrary and subjective; however, they should, whenever possible, reflect field usage and terminology. Duty titles often are used in job analysis for categorizing groups of tasks under identifiable headings to help in the organizing of lists of tasks. At other times, duty titles are assigned for convenience after tasks have been identified and grouped. In either case, the duty title serves to clearly identify closely related groups of tasks.

A good way to write duty statements is to use action words ending in "-ing" to describe duties. This wording fits the intent of the duty statement in the job inventory since the "-ing" relates the word to an entire function rather than to an individual action. The action word generally is followed by an object.

Some examples of duties are:

EXAMPLES

1. For wheeled vehicle mechanics: tuning engines, adjusting and repairing brakes, repairing exhaust systems, repairing suspension systems, and repairing electrical systems.
2. For an administrative officer: evaluating requests for action, planning future work activities, staffing, organizing staff, training staff, implementing plans, and evaluating performance.
3. For an A-7D pilot: preparing for A-7D mission, performing basic flight maneuvers, performing advanced flight maneuvers, and performing instrument flight maneuvers.

1.2.3 Task

Job analysis actually is accomplished at the task level. As you will recall, duties are actually clusters of tasks, the performance of which constitute the duties. Job analysis goes much deeper into job activity description at the task level than it does with the more general duty statements. A task is the lowest level of behavior in a job that describes the performance of a meaningful function in the job under consideration. Examination of the job at the task level allows the job to be described in sufficient detail to serve as the basis for a complete instructional system.

Task statements must be constructed carefully to assure that the final analysis yields usable job performance data. The following are characteristics of tasks and task statements:

1. A task statement is a statement of a highly specific action. The statement has a verb and object.

EXAMPLE

1. "Repair wheeled vehicles" is not sufficiently specific to be a good task statement. To one individual, such a statement might mean performing such actions as "replace wiper blades" and "replace burned-out head lamp". Another person might think it means "overhaul transmission and engine".
2. Also "inspect and repair exhaust system" is not sufficiently specific. However, one task might be "inspect exhaust system," and another task be "repair exhaust system."

2. A task has a definite beginning and end.

EXAMPLE

Such action phrases as "have knowledge of" or "take responsibility for" are not time-ratable and therefore should not be included in a task statement.

3. Tasks are performed in relatively short periods of time, i.e., seconds, minutes, or hours, but rarely, if ever, days, weeks, months, or years. Although no definite time limit can be

set, the longer the period of time between the beginning and the completion of the activity, the greater the probability that the activity is a generality or goal rather than a task.

EXAMPLE

> "To assure a well-trained army" is probably a goal, not a task.

4. Tasks must be observable in that by observing the performance of the job holder or the results of his efforts a definite determination can be made that the task has been performed.

EXAMPLE

> "Understand electronic principles" is not observable. Neither the process nor the results can be observed. (However, certain actions that require an understanding of electronic principles can be observed.)

5. A task must be measurable; that is, in the real world, a technically proficient individual can observe the performance of the task or the product produced by the task and be able to conclude that the task has or has not been properly performed.

EXAMPLES

1. "Know how to" or "be able to" are not measurable. Neither are they observable.
2. "Assure success of mission" is too general to be measurable.

5. Each task is independent of other actions. Each task statement must describe a finite and independent part of the job. Tasks are *not* components of a procedure. In the eyes of a job holder, a task is performed for *its own sake* in the job situation. A task is either performed or not performed by any one job holder. The job holder is never responsible for only *part* of a task. If he is responsible for only a part of a work activity that would otherwise be defined as a task, the part for which he is responsible *is* the task.

EXAMPLE

> If one of the wheeled vehicle mechanic's tasks is "repair exhaust system," "remove muffler" might be one element of the task. (We will discuss elements in more detail later.) However, a helper or trainee might be assigned the *task* of "remove muffler." For the mechanic "remove muffler" is only *part* of his task. His responsibility is not fulfilled until he performs the other appropriate work elements that together constitute "repair exhaust system." However, the trainee's responsibility for this particular work activity ends as soon as he properly "removes muffler." The wheeled vehicle mechanic does not remove the wheel and tire from a vehicle for the purpose of removing the wheel and tire. The removal is part of a procedure intended to accomplish one of several *tasks* such as rotate the tires, repair a flat, or install a new tire. The latter are tasks because they are independent of other actions and are done for their own sake.

Some requirements for writing good task statements are listed in Table I.1, and some examples of satisfactory task statements are listed in Table I.2.

TABLE I 1

Task Statement Requirements

REQUIREMENT	TASK STATEMENT	EXAMPLE
Clarity	*Use wording that is easily understood.*	*"Compare written description to actual performance."* *But Not* *"Relate results to needs of field."*
	Be precise so it means the same thing to all personnel.	*Use words such as "check, coordinate, assist" with caution—they are vague.*
	Write separate, specific statements for each. Avoid combining vague items of skill, knowledge, or responsibility.	*"Supervise files."* *"Maintain files."* *But Not* *"Have responsibility for maintaining files."*
Completeness	*Use abbreviations only after spelling out the term.*	*"Inventory War-Readiness Material (WRM)" may be followed by "Prepare requisitions for WRM."*
	Include both form and title number when the task is to complete a form, unless all that is needed is the general type of form.	*"Complete Task Description Worksheet (Form No. XXX)."*
Conciseness	*Be brief.*	*"Write production and control reports."* *But Not* *"Accomplish necessary reports involved in the process of maintaining production and control procedures."*
	Begin with a present-tense action word (subject "I" or "you" is understood).	*"Clean" or "Write."*
	Indicate an object of the action to be performed.	*"Clean engine." "Write report."*
	Use terminology that is currently used on the job.	*Use most recent military documentation.*
Relevance	*Do not state a person's qualifications.*	*"Load computer tape."* *But Not* *"Has one year computer training."*
	Do not include items on receiving instruction, unless actual work is performed.	*"Prepare lab report."* *But Not* *"Attend lecture."*

TABLE I.2

Samples of Good Task Statements

FUNCTION	SATISFACTORY TASK STATEMENT
Sorting items of mail into pigeon holes.	Sort mail.
Taking a patient's history.	Determine patient's medical history by interviewing patient.
Fixing carburetors.	Adjust carburetor Replace carburetor Rebuild carburetor Depending on what is meant by "fix."
Deciding where to begin troubleshooting of (specific electronic item).	Select troubleshooting strategy for (specific item of equipment).
Establishing the objectives for a course.	Specify course objectives.

1.2.4 Element

An element is the smallest "package" of behavior that has practical meaning to the instructional designers. By "has practical meaning," we mean that further subdivision of the element would be unnecessary since the instructional designers fully understand the element without further subdivision. To be useful as a basis for developing instruction, step-by-step direction and guidance is required as to how the task is performed. The work activities that make up this step-by-step direction and guidance are the elements that make up the task.

The elements that make up each task must be determined for two reasons. First, since many of the tasks will be selected for training, the instructional designer must have sufficient details of the tasks to provide a solid basis for training. If individuals are going to be trained to do a task or be provided with job aids to help them perform a task, those who develop the training or Job Performance Aids must know exactly how the task is done. (Note: Job Performance Aids (JPAs) are manuals, checklists, or any other devices--often attached to equipment--that assist individuals in performing certain operations.)

EXAMPLE

> If the task of "perform before-operation maintenance on 2 1/2-ton truck" will need to be performed, either individuals must be trained to do the task or Job Performance Aids must be provided that will show the individuals exactly how to perform the task. In either case, the instructional developers must know the elements that make up the task. These elements are:
>
> a. Check oil and coolant levels.
>
> b. Inspect pulleys and fan for alignment, and belts for tension. Check water pump and hose clamps for leaks.
>
> c. Inspect air compressor and connections for security of mounting. Check belts for tension.
>
> d. Visually inspect exposed electrical wiring, conduits, connectors, and shielding for cracks or breaks.
>
> e. Inspect engine compartment for indications of fuel, engine oil, or water leakage or seepage.
>
> f. Drain each fuel filter daily before starting.
>
> g. Check level of water in batteries. Check terminals, clamps, and holddown frames for security and corrosion.
>
> h. Check for loose wheels and correct tire pressure.
>
> i. Check general condition of body for scratches, dents, and holes.

j. Inspect cab and cab body mountings and springs.

k. Inspect transfer power takeoff, front winch drum lines, drive shaft U-joints, and shear pins.

l. Check service break for proper travel.

m. Notice if starter pedal requires only normal pressure to engage starter and that engine starts immediately without unusual noises.

n. Check instruments as soon as you start the engine. If oil pressure stays at zero or is very low, SHUT DOWN. Normal idle pressure is 15 psi.

o. Operate horn, lights, and windshield wipers.

p. Listen for any unusual noises with engine under load.

Without at least this level of detail of how the task is done, the instructional designer could not prepare meaningful instruction or meaningful Job Performance Aids.

The second reason for determining the elements that make up a task is that some task statements look alike even though the tasks are quite different. Some task statements may have the same verb and object and only appear different when the elements are added. As an example, note that in Table I.3, while the task statement is the same, the actual task is quite different for the different job levels. The elements that make up the task give a special "flavor" to the task at each job level.

TABLE I.3

Relationship Between Task, Job Level, and Elements

TASK	JOB LEVEL	ELEMENTS
Prepare Reports	Very low	Fill out logs Count units of material Compute indices
Prepare Reports	Intermediate	Combine totals Integrate information Prepare drafts
Prepare Reports	Upper	Check accuracy Finalize format Obtain concurrence
Prepare Reports	Highest	Approve reports Release reports Interpret reports

The tasks in the example differ in the dimensions of complexity and amount of implied activity. Since one use of the list of tasks that make up a job will be to collect data for use in deciding which tasks to train, tasks must be documented in sufficient detail so that those who will later provide you with this data will know what task you are talking about. Often this will require you to list at least some of the elements that make up certain tasks.

In Section 1.2.3, a list of characteristics of tasks was given. All but one of these characteristics of tasks are also characteristics of elements. The last characteristic listed for tasks (item number 6) points out the major differences between a task and an element. These differences are:

1. Each task is independent of other tasks. Each element is dependent upon other elements. An element is relatively meaningless outside of the group of elements that make up a task.
2. Tasks are not components of a procedure. Elements are always components of a procedure.
3. In the eyes of a job incumbent, a task is performed for its own sake in the job situation. An element is never performed for its own sake in the job situation. An element is one step in the performance of a task. The elements of a task constitute a description of how the task is accomplished.

This step-by-step description of the task must be detailed enough to be followed by those who need to understand how the task is performed. This means a great deal of judgment must be used to list elements. There is a lower limit to the degree that elements can be subdivided. This limit is the point at which further subdivision would result in breaking the elements into such basic work units as the separate motions, movements, and mental processes involved. There is also an upper limit to the degree that elements must be subdivided. This limit is the point at which less subdivision would certainly fail to present a clear description of how the task is performed. The practical limit is usually somewhere between these two extremes. You should subdivide the element to the point necessary for communicating with those who will use the information, and no further.

EXAMPLE

> One element in the task of repairing electronic equipment might be "solder connection." If those who need to understand how the task is performed have a clear understanding of "solder connection," it is probably safe to say the element need not be subdivided into smaller "packages" of behavior. However, if this element statement is not clear to those who need to understand the task, further subdivision is required. The new elements might be:
>
> 1. Strip 1/2" of insulation from end of wire.
> 2. Wrap stripped portion of wire securely around terminal.
> 3. Place soldering iron and solder at junction of wire and terminal until solder flows over joint area.
> 4. Remove solder and soldering iron.
>
> If these elements are clear to those who need to understand the task, this is a good stopping point. If not, some of the elements may have to be further subdivided.

Just as important as knowing what the elements are, is understanding the relationships between elements. The elements within a task will be either:

1. fixed sequence (the elements always are done in the same order),
2. alternate path (the specific situation encountered determines the appropriate sequence), or
3. a combination of both.

Diagramming the relationships often is required to understand and remember the relationships. Figure I.4 is an example of a diagram for the task of repairing electronic equipment. Note that the figure shows both fixed-sequence elements (such as 5 through 10) and alternate-path

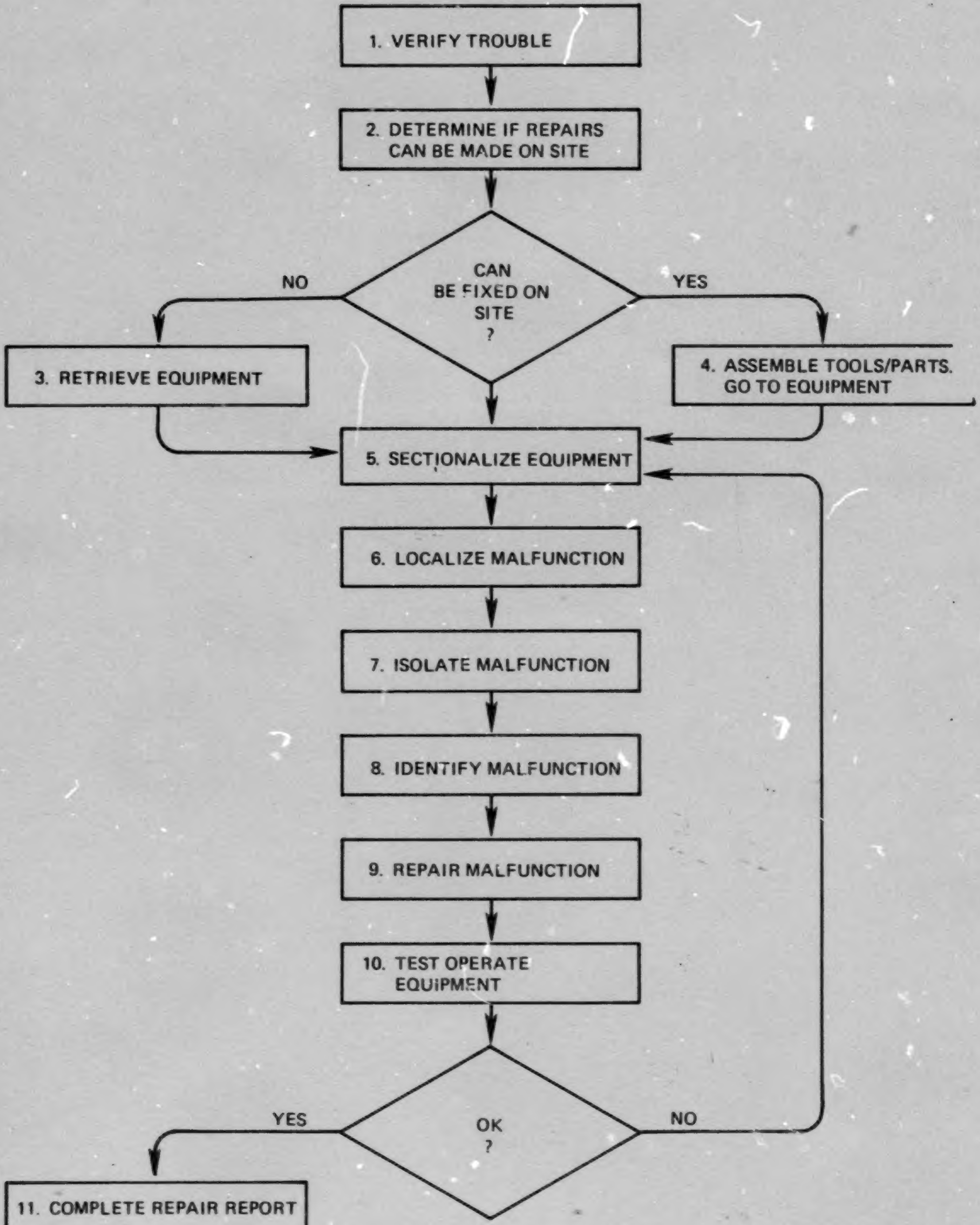


FIGURE I.4: Diagram of Elements for the Task of Repair Electronic Equipment

elements. The first branch shows that the appropriate alternate sequence depends upon where the task is performed (element 3 is one possible path, and element 4 another possible path). The second branch shows that the sequence depends upon whether or not the initial repair corrected the malfunction (element 11 is one possible path, while repeating the fixed sequence 5 through 10 is another possible path).

Some guidelines for preparing a diagram of a task are:

1. Tentatively sketch elements that make up the task, from start to finish, in the order that they are performed on the job. Include all alternative paths.
2. Mentally rehearse the total task. Compare the diagram with your original list of elements. Make sure that no elements overlap and that together the elements account for all performance required in the task.
3. Revise your list of elements, your diagram, or both until you have a perfect match.
4. Number each element on the diagram. Follow the normal job order insofar as possible. The numerical order you assign will structure the order of your list of elements and will make your list more understandable to others.
5. Document carefully since this task may ultimately be handled in this fashion with a Job Performance Aid.

1.2.5 Conditions

Conditions, as used in this block, refer to on-the-job conditions that significantly influence performance of a task. These significant on-the-job conditions provide the basis for determining Job Performance Measure conditions and the necessary training conditions.

EXAMPLES

1. Suppose, in order to accomplish a task, a job holder is required to multiply 3-digit numbers. This statement alone suggests the possible need for training in mathematics. However, if one of the conditions of the task is that the individual performing the task is provided with an electric calculator, the implications for training are considerably different.
2. Another task might require attaching cables to various items so that the items can be lifted. If one condition of the task is that this must be accomplished 200 feet under water, this again has serious implications for training.

The major items that need to be included in an accurate and complete statement of task conditions are listed in Table I.4.

While good job analysis documentation requires a conditions statement for each task, it is often the case that a group of tasks will have identical or nearly identical conditions. This means that careful planning can reduce the effort required in documenting the conditions. One approach is to document the several groups of conditions that appear likely to cover most tasks. Then, for each task, the appropriate group of conditions can be referenced and any additions or deletions listed. Appendix A, page 89, is an example of how this was done for the task of "troubleshoot a telephone set."

1.2.6 Cues

A cue, as used in this block, is the state of affairs or the occurrences that determine, in the job situation, when the job incumbent performs a particular task according to a particular procedure.

TABLE I.4

Guidelines for Documenting Task Conditions

ITEM TO BE INCLUDED IN STATEMENT OF TASK CONDITIONS	EXAMPLES
1. Tools and equipment used to perform the task.	1. Cleanroom overalls 2. Lead-lined gloves 3. A-7D aircraft 4. Soldering iron
2. Special job aids and manuals.	1. Procedural checklists 2. Technical manuals
3. Kind and amount of supervision and assistance normally available during task performance.	1. Job holder performs task completely independent of assistance from others. 2. Task performed under close supervision. 3. Task performed as a member of a team.
4. Special physical demands of the task.	1. Crowded working conditions. 2. Unusual or prolonged physical exertion. 3. Kneeling or squatting. 4. Unusually cramped position.
5. Environmental conditions that influence task completion.	1. Tropical environment. 2. Arctic environment. 3. Desert environment.
6. Location of performance.	1. Air conditioned building. 2. Outdoors in all weather conditions. 3. At night in total darkness. 4. Direct support maintenance van.

EXAMPLE

1. For a wheeled vehicle mechanic, a flat tire on a vehicle that he was supposed to repair would be a cue that should result in his changing the tire or repairing the tire. Other cues, such as length of time before the vehicle must be driven, location of the vehicle, and availability of a spare tire, would determine which of several actions he should take; that is, whether he should change the tire and possibly repair it later, or whether he should immediately repair the tire.
2. Certain cues not only "cause" a medical corpsman to begin the task of administering first aid to an injured person but also determine how he performs the task. If the victim's breathing had stopped, the trained corpsman would not begin first aid by splinting the victim's leg.
3. Sometimes, the cue is "Smith, fix that engine," or "Smith, replace the spark plugs," etc.

What we really mean by "doing a job right" is responding appropriately to the various cues found in the job situation.

EXAMPLE

> If the engine of a 1/4-ton truck does not "crank," this is a cue for the wheeled vehicle mechanic to check the battery and battery cables. However, if the vehicle engine will not start and, as a result, the mechanic changes the tire, he has not done his job satisfactorily even if he did a perfect job of changing the tire. He has responded inappropriately to certain cues.

Adequate job performance clearly consists of more than performing the work elements that make up the tasks that make up the job. The correct order and appropriateness of performance of elements and tasks depend upon recognition of cues and upon knowledge of the correct response to each cue. An adequate job analysis has not been conducted unless sufficient information has been gathered to give the instructional designer a clear idea of the cues to which each task and element is the appropriate response.

1.2.7 Standards

Standard, as used in this block, refers to the acceptable quality of performance of a task in the real-world job environment. The standard for a task is a statement of how well the task must be performed, if and when it is performed.

EXAMPLE

> A task may be "destroy enemy fortification with nuclear warhead equipped missile." Hopefully, this task will never need to be performed. The job analyst is not likely to see the task performed, and from the satisfactory performance write the standard for the task. The standard for this task is how well the task must be accomplished if and when it is performed.

Since a task standard is a statement of how well a task must be performed, regardless of the cost, time, environment, or safety hazards involved in performing the task, the task standard often is not used to actually measure task performance. However, task standards are the basis for job performance measure standards.

EXAMPLES

1. One task of a demolition expert might be to blow up bridges. However, since bridges are expensive and take a long time to build, the job analyst probably would not, by actual observation, measure how well the demolition expert blew up bridges. However, a standard--how well this task must be performed--must be established and agreed upon. This, then, becomes the basis for the standard of performance whatever test is devised to find out if the demolition expert knows how to perform the task of "blow up bridges."

2. One task of a pilot might be to abandon a flaming aircraft. However, this is a dangerous and costly procedure; and, even if the job analyst could afford to judge the pilot's performance by having him actually carry out the task, the job analyst would have considerable difficulty in finding a way to observe the performance. Again, a standard must be established and agreed upon. This task standard is the basis for the standard for the actual measure of task performance. (These Job Performance Measures (JPMs), will be constructed in Block I.3.)

3. One task of a wheeled vehicle mechanic might be "perform before-operation maintenance on 2 1/2-ton truck." For this task, since there are no real constraints to having the mechanic actually perform the task while his performance is observed, the task standard might become the actual JPM standard.

This whole idea of performance testing where serious testing constraints exist will be discussed in detail in Block I.3: CONSTRUCT JOB PERFORMANCE MEASURES. However, the basis for the standards for Job Performance Measures (JPMs) that you will develop in Block I.3 must be sound statements of the standard of performance actually required on the job.

The standard of performance of a task can be described by defining an acceptable product, by defining an acceptable process, or by defining both. The standard should be defined in terms of an acceptable product if:

1. The product is observable and can be inspected.
2. The process by which the product was produced cannot be easily observed.
3. The process is relatively unimportant as compared to the product.

Some examples of tasks where the standards should be defined in terms of a product are:

EXAMPLES

1. Prepare a tactical operations plan.
2. Develop a computer program.
3. Dig trench 5 feet deep and 25 feet long.

The standard should be defined in terms of an acceptable process if:

1. Performance of the task does not leave a readily observable product.
2. Failure to use the correct process could result in damage to equipment or danger to the performer or others.

EXAMPLES

Some examples of tasks where the standards should be defined in terms of process are:

1. Go to the moon and back.
2. Defuse defective bomb.
3. Land aircraft on flight deck.

Often both product and process are important.

EXAMPLE

If a task requires that a motor vehicle be driven from point A to point B, the existence of the vehicle at point B could provide a product standard. However, since the driver might have run 10 other vehicles off the highway in the process, the product standard alone would not be sufficient.

The process standard for the task in the above example probably could be considered to be implied in the task statement. This will be discussed later.

Standards generally describe products in terms of:

1. accuracy, tolerances, completeness, format, clarity, and number of errors, and
2. quantity; that is, the number of work units produced per time unit.

Process standards generally are described in terms of sequence, completeness, accuracy, and speed of performance.

Often, task standards have already been established and are documented in military publications. Some of these publications are listed in Appendix B, page 95. Such documentation can, as a minimum, provide a beginning point from which to derive standards that reflect field requirements. This will be discussed in greater detail later in this block.

Originally, all standards had to be derived either by a panel of experts with experience in performing or supervising the tasks, or from actual job performance data collected by direct observation. This means that if standards for a particular task are not already documented, one of these approaches will be required to derive the standards.

The standards for some tasks can be at least partially derived from the characteristics of the equipment required to perform the tasks.

EXAMPLE

> Long-duration fire bursts by a machine gunner may overheat and damage the weapon. Therefore, in addition to accuracy, the standard must include a maximum burst duration.

Standards should be documented in sufficient detail to accurately communicate the requirements of the job to the instructional designer who will use this information. Often, to simplify writing the standards statements, a number of implied standards are not included in the documentation but are intended to be a part of the standard. Some of these implied standards are "complete and accurate," "submitted on time," and "correct solution." This means that for some tasks, the standard of performance is implied in the task statement and need not be listed as a separate item.

EXAMPLE

> If a task is to drive a 1/4-ton truck from point A to point B, "obeying traffic laws" can normally be assumed to be part of the standard. This means it is an implied standard. However, in the case of a military policeman, the task may require that he violate certain traffic laws. If this is the case, the standard must be stated.

While standards for some tasks can be confidently and objectively stated, standards for many tasks are highly subjective. What would be the standard for "repair carburetor on a wheeled vehicle"? Suppose product standards for repaired and rebuilt carburetors are well documented in technical manuals. Does this product standard provide an acceptable standard for performance of the task? If it takes the mechanic two months to make the repair, is that acceptable? If not, how long should it take? But how long it takes depends, at least in part, on what is wrong with the carburetor. To determine a separate standard for making each possible combination of repairs to the carburetor would be a huge effort; fortunately, this is not necessary. If a time standard is derived, the maximum length of time required by most mechanics to make most repairs should be adequate. Any exceptionally lengthy repairs could be given a separate standard if such repairs were in fact found to exist.

1.3 Overview of Job Analysis

Job analysis begins, then, with the recognition of a discrepancy between job performance ability and job performance needs--a discrepancy that cannot be corrected by existing training courses, either because no such course exists or because analysis of existing courses (Block I.4) indicated that no acceptable course exists.

The first step in developing adequate training is to collect valid and reliable data about the job. The original source of valid and reliable job data is job analysis. The steps in carrying out the job analysis are shown in Figure I.5 (the foldout page at the end of the block).

As you will note on the flowchart in Figure I.5, there are alternate routes for getting from the beginning to the end of this block. The procedures that follow will indicate the advantages and disadvantages of the different routes. The ISD process does not dictate a specific procedure. The basic requirement is that you make logical decisions based on the resources and constraints with which you must work. The guidelines that follow will assist you in making those logical decisions.

Regardless of the route that you take through this block, the ultimate end product, or output, must include a validated list of tasks that make up the job. These tasks must be described in sufficient detail to permit collection, in Block I.2, of valid and reliable data for use in making decisions as to which tasks will be trained. In addition, for those tasks selected for training, sufficient information such as conditions, initiating cues, standards, and elements must be collected and verified to provide a sound basis for developing Job Performance Measures (JPMs) in Block I.3, selecting or designing instruction in Phase III, and conducting external evaluation in Block V.2.

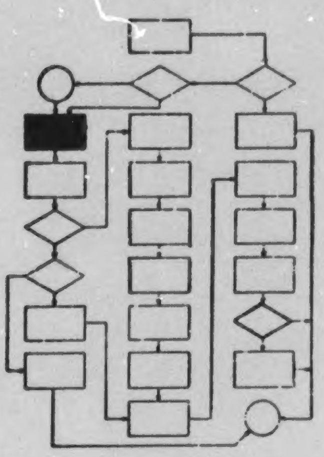
Although job data often are collected at the lowest level of organization (the sailor, artilleryman, repair man, or supervisor), the procedures used must be coordinated and controlled at higher levels of command. If this is not done, the personnel system or training program may reflect "what exists" rather than "what should be." If a school performs job analysis and uses the data to construct a training program without careful screening or review, there is a serious risk of reflecting too many "field expedients" or "stopgap" measures. Doctrine must be carefully and appropriately combined with job data.

The job data must be reviewed by responsible staff who will contribute to them. When this approach is used, more than just approval or disapproval will result. Often there will be a change in applicable doctrine or regulation controls. This procedure helps coordinate such related actions as recruitment, selection and assignment, equipment research, development, and procurement. What has been developed is basic management data. Such data can be of considerable value if it is furnished to each cognizant manager in the system.

2.0 PROCEDURES

The procedures section of this block, and every other block, will follow the flowchart on the last page of the block. It may help you keep track of where you are on the flowchart if you leave the flowchart folded out while you use the procedures section. At the beginning of each step in the procedures is a reduced copy of the same flowchart, with the appropriate step identified. By comparing the two, you should be able to keep up with exactly where you are in the block.

2.1 Review Available Job Information



When you receive a job analysis assignment, the target job may or may not be familiar to you. There probably is one advantage to not being familiar with the details of the job. You may try harder. The result might be that you will pay more attention to the actual details of the job and will tend to dig deeper into the relationships of each part. This will result in a clearer picture of how each part of the job relates to each other part and where these bits of job activity fit into the total picture of the job.

However, starting off being unfamiliar with the job does not mean you can stay that way. Regardless of your degree of familiarity with the job, your first step is to find out as much as you can about the job from both official and unofficial documents. The primary purpose of this review of available job literature is to:

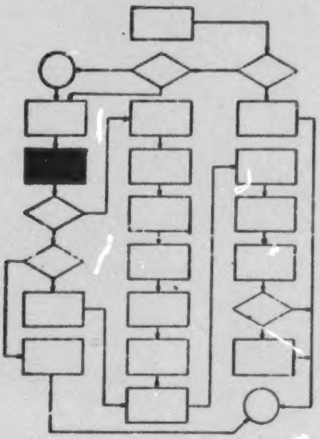
1. Learn as much as you can about the general nature of the job.
2. Find out how much, if any, of the job analysis work has already been done.

3. Prepare, if little or no job analysis work has been done, a tentative list of duties and tasks that appear to make up the job.

By reviewing available job literature, you will become more familiar with the job and you will get a clearer idea of how much work needs to be done to complete the job analysis. These are things you will need in the next step of planning your job data collection method. Appendix B, page 95, of this block lists a number of job information sources. In addition to reviewing available documents, you should not hesitate to check your initial ideas of the nature of the job with any available individuals who are familiar with the job.

2.2 Develop Data Collection Plan

Once you are familiar with the general nature of the job and with any job analysis work that has already been done, you are ready to develop your data collection plan. Some of the more common ways of collecting job data are:



1. Individual and observation interviews.

The on-site interview and observation method involves sending expert job analysts to interview job incumbents (job holders) and their supervisors, and to observe job incumbents performing the work activities. In the individual interview, data can be collected on duties and tasks performed, frequency and duration of performance, conditions under which tasks are performed, tools and equipment needed, cues that initiate task performance, to what standards the task must be accomplished, and the elements that make up the tasks.

The observation interview is essentially the same as the individual interview except that the job holder is observed in the job environment performing all or a substantial part of the job. As the job holder performs the tasks, the analyst may ask questions to obtain a better understanding of the job.

The individual and observation interview approach is probably the most practical data collection method for getting detailed information about a job. It permits flexibility in getting the required data and provides an opportunity to evaluate the quality of the responses.

Disadvantages of the individual and observation interview method are that it is a time-consuming process, it is expensive to apply, and its effectiveness is largely dependent upon the skills of the job analyst. Also, it may provide some nonessential or erroneous information. This can be corrected by interviewing several individuals in different locations. Even though these disadvantages tend to limit the number of people interviewed, there is doubt as to the validity of any job analysis data collected by a method or combination of methods that does not include some individual and observation interviews. Even though the number of people interviewed is small, the importance of such field work is great.

2. Questionnaire survey. The use of questionnaires permits the job analyst to make limited contact with a large number of individuals. Questionnaires have the advantages of yielding large amounts of information at a relatively low cost and of not requiring trained interviewers, This survey method requires the inclusion of very clear instructions since the

job analyst will not be present to give assistance and answer questions. A major disadvantage of questionnaires mailed to individuals is that returns tend to be low, especially if the questionnaire is long and involved and must be filled out on a person's own time.

Questionnaires can be mailed to individuals who are asked to complete and return the questionnaires. Or they can be administered to groups of job incumbents and supervisors by local personnel who have the responsibility and authority to make sure all questionnaires are completed and returned. The effectiveness of a questionnaire survey depends largely on whether you have available a "system" or organization responsible for conducting such surveys. With such a system, you can be assured of having your questionnaires completed and returned to you. This is true because such a system has the authority to "make it happen." Without such a system, the results of a questionnaire survey may be less than desirable.

There are two basic types of questionnaires, the closed form and the open form. The closed form contains a list of possible items to be selected or blanks to be filled in with words or numbers. This form has several advantages. It is likely to take a minimum amount of time to complete, thus increasing the chances that it will be completed and returned. The process of tabulating and summarizing responses is simpler and less time consuming than with an open form questionnaire. Machine tabulation and computer analysis of the completed forms are practical when a large number of questionnaires are used. However, the closed form is much more difficult to prepare. The designer must be sure to include all possible responses that he expects from any of the people who will complete the questionnaire. Also, the designer must construct items on the form so that they clearly communicate to the users exactly what the designer is trying to ask. All but the last item in the questionnaire in Appendix C, page 100, and Appendix D, page 103, are examples of closed-form questionnaires.

The open or free-response questionnaire gives the user a great deal more freedom in responding to questions about jobs. More complete answers to questions are possible. It is less demanding on the designer because the danger of overlooking certain responses or the necessity of minimizing the number of responses is reduced. However, this form has several serious disadvantages. It is much more difficult and time consuming to fill out, and tabulating and summarizing the responses is a complex and time-consuming effort.

Questionnaires can, of course, combine the open and closed forms. Examples of open-form items are the last item in Appendix C, page 100, and Appendix D, page 103.

3. Jury-of-Experts. With this method, a group of personnel, selected for their experience and knowledge of the job, is brought together to record and organize the required job analysis data. This method is particularly useful in collecting job data on new jobs or on managerial and supervisory jobs where many of the most critical behaviors are not directly observable. Also, the Jury-of-Experts method can be effectively used as a supplement to individual and observation interviews. Since the members of this jury are experts in the job being analyzed, their collective effort should be decisions about the requirements of the job. In general, their greatest effectiveness is in evaluating and making decisions about job data that have been collected from other sources by other means.

This method can be very expensive because of the personnel involved and the time required. Also, if all of your experts come from schools, there may be a tendency for the outcome to reflect what exists in training rather than what actually exists on the job. Experts should be sampled from a number of different areas; they should not all come from schools.

4. Group interviews. With this method, a group of job incumbents are brought together to provide information about their jobs. The job analyst interviews the job holders as a group, asks questions about job performance, and possibly has the group list job data on data collection forms. Unlike the jury of experts, the group interview generally is not a decision-making body. Its primary function is to provide information about their jobs, not to make decisions about existing data or organize the new data.

The group interview is a relatively inexpensive approach to collecting job data. It can be put to good use in gathering data on tasks that cannot be easily demonstrated or observed in the real world (for example, tasks that are performed only in combat). However, because the group interview involves recall, rather than recognition, it tends to provide data that are incomplete or inaccurate.

Most job analysis data collection plans for existing jobs include some combination of the four data collection methods we have just discussed. In order to help you develop an appropriate plan for your particular job analysis effort, we will discuss the techniques and reasons for each of four different plans. One of them should fit your situation. These four plans are:

1. Analysis of new job
2. Initial emphasis on on-site interviews
3. Initial emphasis on questionnaire survey
4. Other

Figure I.6 shows the more probable alternate paths that you might choose for carrying out the activities required in Blocks I.1, I.2, and I.3. Reasons for choosing a particular path will be given along with the following discussion of the techniques and reasons for choosing a particular one of the four plans listed above.

2.2.1 Analysis of New Job

If the job you are going to analyze is a new job (that is, no one is doing the job now), the only data collection methods discussed earlier in this section that will be of much use to you is the Jury-of-Experts method. The other methods all are directed toward finding out what an existing job is like. Job analysis for a new job requires drastically different approaches. These are discussed in detail in Section 2.16 of this block. If you are analyzing a new job, turn to Section 2.16 for details of how to proceed.

2.2.2 Initial Emphasis on On-Site Interviews

For an existing job, there are only two reasons for not beginning your job data collection with on-site interviews of job holders and supervisors:

1. There already exists a current, complete list of tasks that make up the job, and you have available in the field individuals with the responsibility and authority to assure completion and return of questionnaires designed to validate the existing task list.

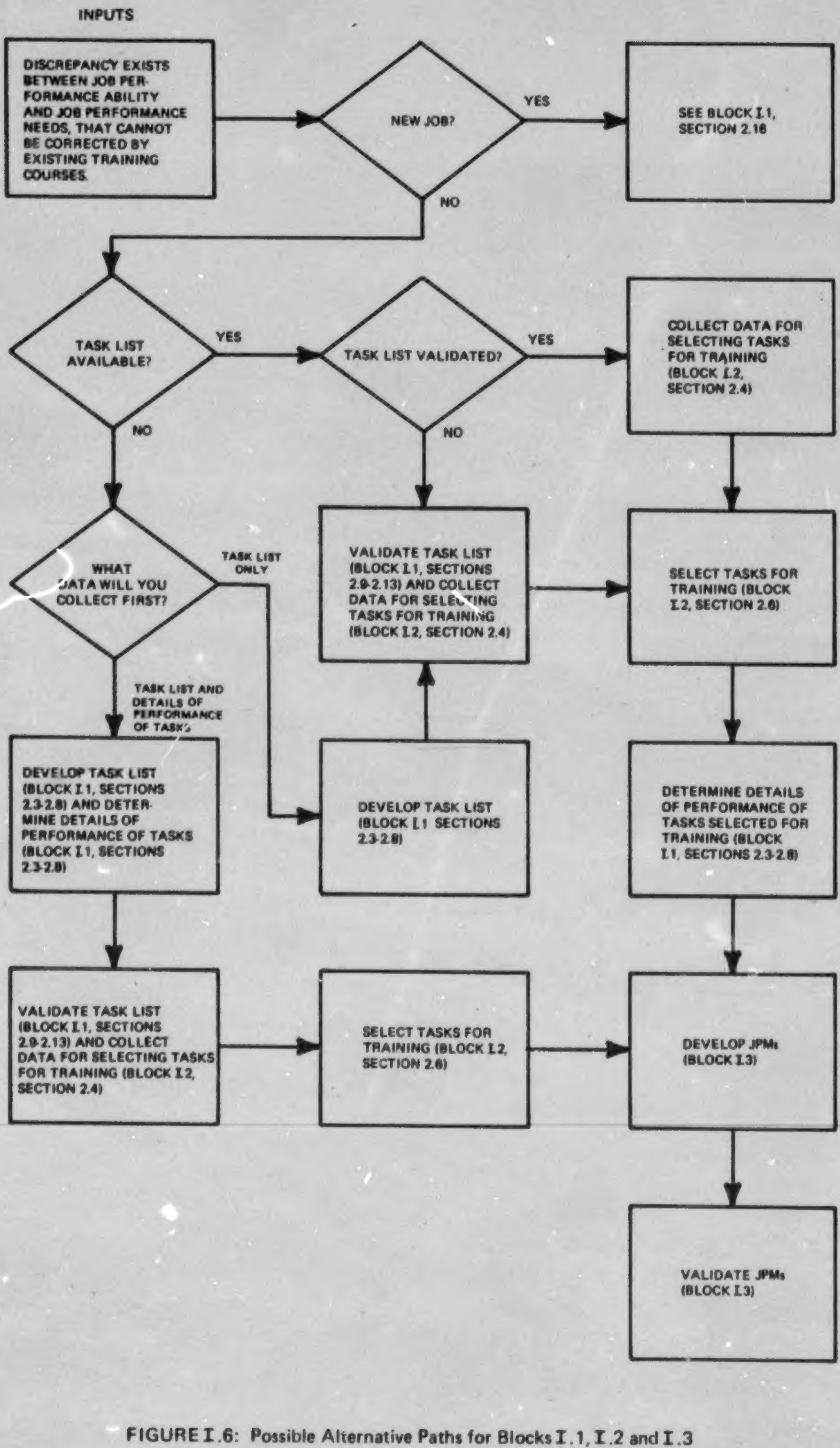

INPUTS
DISCREPANCY EXISTS BETWEEN JOB PERFORMANCE ABILITY AND JOB PERFORMANCE NEEDS, THAT CANNOT BE CORRECTED BY EXISTING TRAINING COURSES.
NEW JOB?
YES
SEE BLOCK I.1, SECTION 2.16
NO
TASK LIST AVAILABLE?
YES
TASK LIST VALIDATED?
YES
COLLECT DATA FOR SELECTING TASKS FOR TRAINING (BLOCK I.2, SECTION 2.4)
NO
NO
WHAT DATA WILL YOU COLLECT FIRST?
TASK LIST ONLY
VALIDATE TASK LIST (BLOCK I.1, SECTIONS 2.9-2.13) AND COLLECT DATA FOR SELECTING TASKS FOR TRAINING (BLOCK I.2, SECTION 2.4)
SELECT TASKS FOR TRAINING (BLOCK I.2, SECTION 2.6)
TASK LIST AND DETAILS OF PERFORMANCE OF TASKS
DEVELOP TASK LIST (BLOCK I.1, SECTIONS 2.3-2.8) AND DETERMINE DETAILS OF PERFORMANCE OF TASKS (BLOCK I.1, SECTIONS 2.3-2.8)
DEVELOP TASK LIST (BLOCK I.1 SECTIONS 2.3-2.8)
DETERMINE DETAILS OF PERFORMANCE OF TASKS SELECTED FOR TRAINING (BLOCK I.1, SECTIONS 2.3-2.8)
VALIDATE TASK LIST (BLOCK I.1, SECTIONS 2.9-2.13) AND COLLECT DATA FOR SELECTING TASKS FOR TRAINING (BLOCK I.2, SECTION 2.4)
SELECT TASKS FOR TRAINING (BLOCK I.2, SECTION 2.6)
DEVELOP JPMs (BLOCK I.3)
VALIDATE JPMs (BLOCK I.3)

FIGURE I.6: Possible Alternative Paths for Blocks I.1, I.2 and I.3

2. Constraints of time or funding demand that you do a less than adequate job analysis. Experience has shown the clear advantage for doing the first job analysis right. If it is done right and completely, it tends to minimize the changes necessary when it comes up for periodic review (every four years, more or less, depending on command decisions). Further, the job analysis portion of the Phase I effort is probably the most important part of the total effort. Keep in mind the old familiar saying: We never have time to do it right, but we always have time to do it again. It must have been written by a professional job analyst who was pressed to do a quick and dirty job in the name of expediency.

In item 1, 2.2.2, "current" means that the job is not likely to have changed significantly since the task list was prepared. "Complete" means you can determine with reasonable assurance, by reviewing the list with several technical advisors, that no tasks are left off the list. At this point, we do not mean that conditions, initiating cues, standards, and elements are listed for each task.

Since this task list might have been prepared from various technical documents rather than from actual interview and observation data, validation of the task list by a large number of job holders and supervisors becomes critical. This is the reason for the need for assurance that all or most of the questionnaires used to validate the list will be filled out and returned.

If neither item 1 nor item 2 fits your particular situation, your data collection plan should be:

1. Select and train on-site interview job analysts, unless such personnel are already available. (Section 2.3).
2. Prepare or select interview/observation data collection forms. (Section 2.4).
3. Select interview sample. (Section 2.5).
4. Make administrative arrangements for interviews/observations. (Section 2.6).
5. Conduct interviews/observations, and collect data. (Section 2.7).
6. Consolidate data. (Section 2.8).
7. Prepare survey questionnaires. (Section 2.10).
8. Select survey sample. (Section 2.11).
9. Conduct questionnaire survey. (Section 2.12).
10. Revise job data as required. (Section 2.13).
11. Collect any required job data that has not already been collected. (Section 2.14).

Each of these steps is discussed in detail in Sections 2.3 - 2.14 of this block.

Three additional decisions will have to be made before you can call your data collection plan complete. First, in collecting data in step 5 above, how much data are you going to collect? You have two major options:

1. Concentrate on listing the tasks that make up the job. Collect only enough information to prepare a complete,

understandable task list. After you select tasks for training (in Block I.2), return and collect conditions, cues, standards, and elements, gathering information on only the tasks selected for training.

2. Initially gather all the information you are likely to need on all tasks.

You should decide between the two, based on convenience and economics. If you are stationed in Washington, D.C., and the job interviews must take place on an aircraft carrier in the middle of the Pacific, you probably will wish to collect as much information as possible on the first trip. However, if much of the interviewing will be done near where you will be anyway and if the individuals who will be interviewed are readily available at any time, you probably will wait until after you select tasks for training before going back for more detailed information.

A second decision you must make is whether Job Performance Measures (JPMs) will be developed at the same time you are conducting interviews/observations. Often a different person or group develops JPMs. However, if the same people will be analyzing the job and developing JPMs, there is nothing wrong, particularly in remote locations, with getting as much information and assistance as possible on the first trip.

A third decision has to do with step 9 on page 44. In conducting your questionnaire survey, will you only validate (make sure of the accuracy of) your task list? Or will you also collect the Block I.2 data for use in making decisions as to which tasks to train? Where both groups of data will be gathered from the same group of people, you should do both at the same time; that is, with the same questionnaire survey. However, some of the data you will need in Block I.2 may be required from a different group of people. For collecting such data, you will need a different questionnaire and a different survey. Either way, it probably is clear to you that you are going to have to become familiar with Block I.2 before you can make that decision.

2.2.3 Initial Emphasis on Questionnaire Survey

If a reasonably current and complete task list already exists, and you have resources for conducting a thorough questionnaire survey, your data collection plan should be:

1. Verify task inventory. (Section 2.9).
2. Prepare survey questionnaires. (Section 2.10).
3. Select survey sample. (Section 2.11).
4. Conduct questionnaire survey. (Section 2.12).
5. Revise job data as required. (Section 2.13).
6. Collect any required job data that has not already been collected. (Section 2.14).

The only additional decisions you have to make with this plan are the last two decisions discussed in 2.2.2. Again, if the same individuals who perform the job analysis also will develop JPMs, particularly in remote locations, part of development of JPMs can be done concurrent with step 6 above. Also, where the validation data and the data for making decisions as to which tasks to train will be collected from the same group, both data should be collected at the same time.

2.2.4 Emphasis on other Data Collection Methods

Unique conditions or constraints in your command may dictate that you use some data collection plan other than the ones discussed above. In general, when you are forced to deviate from the plans already discussed, the effectiveness of training programs based on the job analysis will be reduced. The data collection plans already discussed are recommended because they have proven to be a sound basis for training programs. This cannot be said of short-cut plans that you may be forced to use.

There occasionally are practical reasons for adopting a less-than-ideal plan.

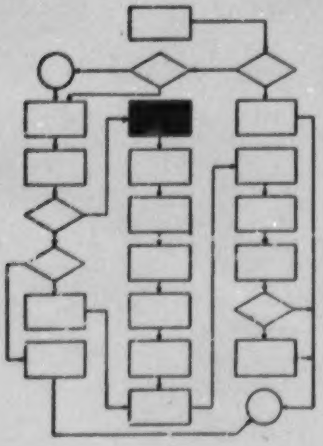
EXAMPLES

1. If some emergency situation demanded that a training program be put into effect in a very short period of time, a number of short-cuts might have to be taken. The resulting training might be less than ideal, but it might have to suffice--at least until you have time to do it right.
2. If a relatively minor change in a weapons system made necessary some changes in a few tasks that made up a job, it probably would not be practical to analyze the entire job to make these relatively minor changes or additions.

The primary point here is that, if you short-cut any part of the job analysis procedure, it should be a thoroughly documented, planned deviation. You should know you are doing it, know why you are doing it, and be willing to accept the less-than-optimum outcome that may result from it.

Details of carrying out alternate data collection plans are discussed in Section 2.15 of this block.

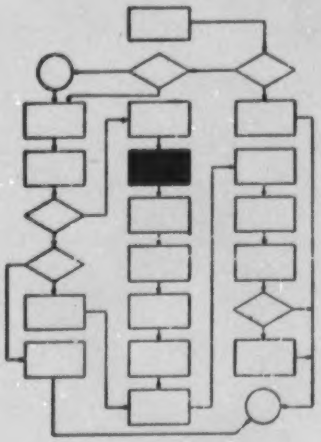
2.3 Select and Train Job Analysts



Job analysis should be performed only by carefully selected military and civilian personnel who are competent in the conduct of job analysis. Some team members may be drawn from an instructional staff, but the team should include representatives from all of the command elements involved in decision making. Hopefully, at least most of your team will be skilled at job analysis. If you have some members who have little or no training, you should team them with skilled personnel until they have demonstrated their competency in a job interview situation.

Regardless of the amount of previous training, each team member will need to review the information that you have collected about the specific job to be analyzed. Each member must become familiar with the general nature of the job. The job analysis training program allows them to examine background materials and resolve differences of opinion about what constitutes the job. This training prepares the team members to record and document details of the work activities as they are performed in the field. Since different people will be involved in studying the same types of work activities, it is important that each records what he sees, in the same fashion, and that each tries to look at various factors in the same way. Each of the job analysts, however, comes from a different background. Each tends to interpret things differently in terms of this background. The exchanges and arguments during the job analysis training period, particularly coming to agreement on terms and interpretations, is an extremely important part of the readiness program for effective job analysis.

2.4 Select or Prepare Interview Data Collection Forms



Two basic types of forms are needed for recording the interview data. The first is a form for recording background information about the person being interviewed. This form includes identification information, location, previous experience and education, and other job-related information apart from the specific duties on tasks performed. An example of such a form is shown in Figure I.7.

The other basic form is for use in recording the actual job data. This form can serve an additional purpose of giving some structure or guidance to the analyst to assist him in asking the right questions and making sure he has the details he needs. You will want your data collection forms to aid the members of your job analysis team in collecting information in a systematic manner, but at the same time be sufficiently flexible to permit your team to handle unique situations. The design of the particular form you should use depends, of course, on the degree of detail you have planned to reach in the particular interview. If only the tasks are to be listed, a relatively simple form will be adequate. If you wish to collect detailed information about each task, a form such as that shown in Figure I.8 should be adequate. Details of how to use such a form will be given in section 2.7.

JOB ANALYSIS INFORMATION SOURCE

DATE ____________

A. Identification Information:

1. Name ________ Rank __________ Svc.No. ______________________
2. Present Work Assignment ______________________
3. Primary Specialty ______________________
4. Secondary Specialty ______________________
5. Present Pay Grade ______________________

B. Job Location Information:

1. Official Designation of Unit ______________________
2. Mailing Address ______________________

____

3. Telephone Number and Extention ______________________
4. Present Geographical Location ______________________

C. Experience and Other Job Related Information:

1. Total Months in Present Work Assignment ______________________
2. Total Months in This Career Field ______________________
3. Total Months at Present Base ______________________
4. Total Months in Active Military Service ______________________
5. Re-enlistment Plans ______________________
6. Highest Education Level Completed ______________________
7. Number of Subordinates Supervised ______________________
8. Primary Job Interest ______________________
9. Training Received for Present Work ______________________

FIGURE I.7: Sample Background Information Form

JOB DATA WORKSHEET

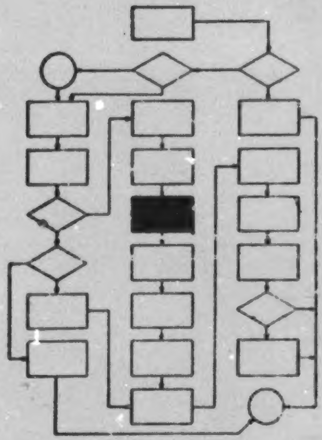
JOB TITLE ______ DOS ______ PAGE NO. ______

DUTY/CODE ______ LEVEL ______ DATE ______

ITEM CODE	TASK, ELEMENTS, J.P.M.	CONDITIONS	INITIATING CUES	STANDARDS	NOTES

FIGURE I.8: Sample Job Data Worksheet

2.5 Select Interview Sample



You are now ready to select organizations and individuals to provide you with the needed job data. The complexity of the job, the availability and quality of published sources of job information, and the number of people in the particular job will, of course, determine how much and what kinds of information you need to collect. This will strongly influence the make-up and size of your sample. If the complexity and amount of required data are great, the number of organizations and individuals interviewed will increase.

At the beginning, it is neither possible to know which job holders and supervisors will give the best and most complete information, nor to know precisely how many interviews will be required. While most people will be cooperative and try to help, you are likely to get different pictures of the job from different individuals. This is the reason for interviewing a number of people. In this way, you eventually will get a clear picture of the job as it is actually being performed. Some individuals will describe the job the way it is rather than the way it ought to be. Some will describe it as it ought to be rather than the way it is. Others will describe it the way they wish it were. Some will simply know more about the job than will others and will be able to provide more good information. For these reasons the number needed is likely to be determined as the interviews progress. The job analyst stops interviewing when he and authoritative advisors believe the information collected presents a well-structured and essentially complete picture of the job. At this point, additional interviews yield very little, if any, new information. Instead, the new inputs begin to look more and more like the information already collected.

From five to ten interviews from each of several representative units often will be adequate for a preliminary task list in a relatively simple job. Perhaps at least twice this number will be required if all necessary information about each task is collected. As a general rule, and to the extent practical, the more interviews the better. At least it is safe to say that too many interviews is better than too few.

In selecting units for interviews, you should select units that:

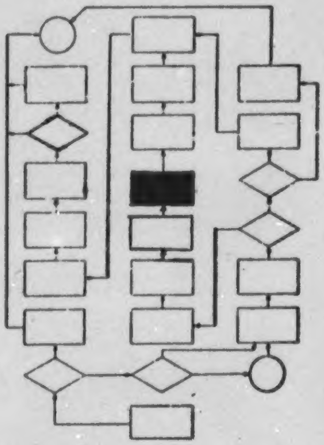
1. Have at least a small number of job holders and supervisors who do the particular job to be analyzed. Preferably, you should choose some units that have a relatively small number of job holders, and some units that have large numbers.
2. Are geographically and environmentally representative
3. For interservice programs, are representative of each service

In selecting individuals within the units, you should select a group made up of individuals who:

1. Perform and supervise the job being analyzed (The group should include both workers and supervisors.)
2. Perform with average satisfactory proficiency
3. Are representative in terms of length of time on the job
4. Are representative in terms of training

In addition to the preceding, you will want to choose at least a few job holders or supervisors who are acknowledged experts at the job. From these individuals, you may get some details of certain tasks that you cannot get from any other source.

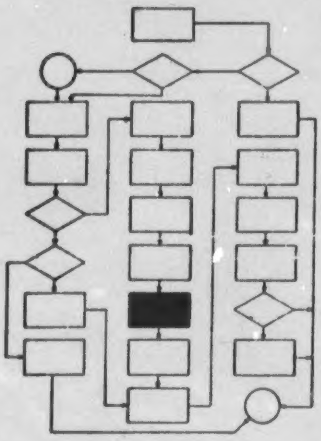
2.6 Make Administrative Arrangements



As soon as you have selected your survey sample, you need to coordinate administrative arrangements to include some or all of the following:

1. Command approval
2. Funding
3. Preparation of orders
4. Obtaining passports and visas
5. Innoculations
6. Travel reservations
7. Notification of units or organizations to be visited for purpose, time, and duration.

2.7 Conduct Interviews and Collect Data



You are now ready to conduct interviews and observations and record the data. This can be one of the most difficult and rewarding efforts in the ISD process.

2.7.1 Conduct Standard Briefings

Upon arrival at each unit, you and your team should present a standard briefing to headquarters staff personnel, commanders, supervisory personnel, and the job incumbents in the survey sample units. These briefings are very important because the full cooperation of all involved and concerned is very critical to the success of the job analysis. Depending on the number of people involved, one briefing may not be enough. Maybe a different briefing for each of the different levels must be prepared and presented. The briefings must be well-prepared and professionally and sincerely presented. They must communicate to the lowest level that we all want to do a better job and the only way adequate information can be gathered is to go directly to the actual on-the-job person and to his supervisors. Following is a list of the reasons why the briefings are given to the various groups listed. The briefings prepared for each group should fulfill these needs.

1. Headquarters staffs. The job data developed will become the basic management information for this group. They must know before the fact what you are doing, how you are doing it, and what product you will deliver. They should also realize that you are merely going to report what is happening in the field. If what is happening is not what people think is happening then they (the headquarters) will have to examine the data and make decisions about what will be changed, modified, or returned to that which was originally envisioned. If the way the job is actually being performed in the field is not the way headquarters wants it to be performed, they must make decisions and take appropriate action to correct the variance. They

must tell you what changes, if any, they intend making to insure that your final job analysis data reflect what should be as well as what is.

2. Commanders. The commander of the unit you will visit must be made to realize that you are not an audit team or an inspector general. You are there to observe the way his jobs are done so that the training, personnel, logistics, force development, etc., people may be more aware of the commander's position and more responsive to his needs. You require his support and understanding. If he gives you the "key to the unit," your job analysis can be done well. If he resists you, you will be relegated to the role of spy, troublemaker, etc. Remember, however, you are coming to him with the support and blessing of a higher headquarters. This may help on the surface--but you must convince the Commander on a one-to-one basis and get his genuine and sincere cooperation.

3. Supervisory personnel. The supervisor of the people whose jobs you are analyzing is a key person. You need his assistance in selecting job incumbents and in verifying data you gather. He needs, also, to be convinced that your team purposes are honest and in his interest. Generally, you can get his support by telling him exactly what information you need, exactly why you need it, what you are going to do with it, and why you need his help in making the program a success. Some of the details or examples outlined for higher level commanders might not be meaningful to him, so more appropriate examples may have

to be developed for his briefing. Remember also to tell him that, when you are looking at the job system within which his people work, you must also look at his job from the point of view of what influence he has on the conditions of the job incumbent; i.e., supervisory assistance, standards of proficiency and how he enforces them, and the parts of the job he performs. Be sure to emphasize to him that you want to know what is, as well as what is supposed to be.

4. The job incumbent (job holder). The job incumbent is going to provide the real meat of the job analysis data. He is doing the job. He knows what the problems are. You need to get information from him. He is a full member of the military community. Tell him this. Tell him why you are doing the survey and why you must come to him. Convince him that he is important, because he is. If you do this effectively and assure him that you have his commander's and supervisor's sanction, he will be a real source of valuable information. Promise him--and deliver--feedback on the project as you move toward action to solve problems. Give him an investment and a future in his occupation and his branch. Contributing in this way to "morale and welfare" can be a valuable part of the job analysis endeavor.

At the same time that you are preparing briefings, you should develop a schedule for conducting the data collection. A typical schedule is shown in Figure I.9.

DAILY SCHEDULE FOR CONDUCT OF COMMAND JOB ANALYSIS

Note: If the Command Job Analysis Team arrives after noon of the first day, then the second actual day at a station should be considered as the first day.

First Day:

1. Command Job Analysis Team Briefing for Unit Commander
2. Command Mission Briefing for Job Analysis Team
3. Tour of the Facilities
4. Unit Analysis Interviews with Operations Officer
5. Identification of Major Work Areas

Second Day:

1. Briefing of Staff (including discussion of interview requirements)
2. Study of Nominee Records
3. Selection of Job Analysis Participants
4. Study of Operations Area to Identify Environmental Conditions
5. Briefing of Job Holders and Others to be Interviewed
6. Setup of Interviews

Third Day, Fourth Day, etc.:

1. Interview
2. Observation
3. Interview
4. Observation
5. Etc.

Last Day:

1. Continuation of Interviews/Observations
2. Exit Briefing

FIGURE I.9: Sample Interview/Observation Schedule

2.7.2 Select Interviewees

As soon as you have briefed the unit commander and his staff, your team must brief the unit staff on the criteria for the selection of individuals to be interviewed and observed. The criteria were outlined in Section 2.5 of this block.

Your team should review the records of those who are nominated and select for participation those who best meet the criteria. In addition to the briefing outlined in the preceding section, members of your team also should review the briefing with the participants when you meet, individually, in their work areas. This is where the real motivation can take place. These meetings should reduce or eliminate any remaining anxiety about the interviews/observations.

2.7.3 Collect Identifying Information

All information required to identify a particular job analysis report, to fully identify the unit in which the person being interviewed works, and to present background information about the man himself should be recorded on the background information form you prepared in Section 2.4. One copy should be completed for each person interviewed.

2.7.4 Interviewing, Observing, and Recording Data

In conducting interviews with the job incumbents and supervisors, your team members should establish a good working relationship with them before attempting to collect data. The briefings mentioned earlier should have done most of this. If the person being interviewed still has questions about his role in the interview, answer his questions as honestly as you can. Be sure that, when the actual data collection gets under way, that the person being interviewed is the one to describe his duties and tasks. Do not tell him what you think he does; let him tell you. Get at the specifics of the job performance and record the data carefully. Ask questions about things you do not understand. When the interviewee no longer can give pertinent and useful information, end the interview.

If, in Section 2.2, you decided to collect only task inventory information on the first visit, let the interviewee know about this. Let him know you will be coming back later for additional information about some of the tasks.

Remember that the job incumbent most likely performs only those tasks assigned to him. He may not do all the tasks that make up the job. Different supervisors split up work activities among the workers in different ways. Also remember the job holder may perform some tasks incorrectly. These are some of the reasons for interviewing more than one job holder and for also interviewing supervisors.

When your team members observe the job incumbents performing their duties and tasks, be sure the analysts:

1. observe long enough to witness performance of all tasks that the analysts do not understand, based on the interview information,
2. avoid getting in the way,
3. ask questions only when necessary, and
4. make careful notes of observations.

While it is essential that task statements be specific, unambiguous, and have the same meaning to all who will use the information, it is not essential that your original notes and statements be this perfect. During the early stages of job analysis, do not worry about the size of the group of activities you call tasks, or about overlapping and duplicating statements. Identifying tasks is a process that requires reviewing, reexamining, and rewriting several times. Each time the cycle is repeated, the resulting task inventory is more complete and accurate.

You probably will not be able to observe the job incumbent performing all the tasks you wish to observe.

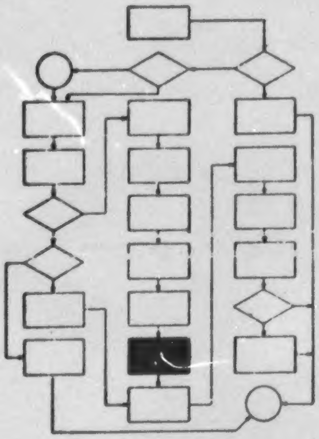
EXAMPLES

1. It would not be possible to schedule the fire fighter to "remove a conscious injured person from the upper floor of a burning building."
2. "Destroy enemy submarine" would be performed only under combat conditions. The job analyst is not likely to observe the performance.
3. While a part of "correct malfunctions in electronic equipment" could be observed, too much time would be required to observe correction of all possible malfunctions.

But, for those tasks or parts of tasks that are seldom performed, he can use indirect methods to gather the necessary job information. He can use descriptions of tasks by supervisors, experienced job incumbents, or other experts, and analysis of such information sources as film or video tape. The procedure must be systematic; it must involve verifying the job task with more than one job incumbent and with more than one supervisor.

The output of this section is several groups of job information; one group of information from each interview by each member of your job analysis team. Each group of job information will include the duties and tasks that make up the job. In addition, for each task (or for each task selected for training, if your data collection plan called for coming back later for details of the tasks) the conditions, initiating cues, standards, and elements will be listed. Some of these latter items, particularly the elements that make up the tasks, may already be documented. This means you will need only to find the documentation and check its accuracy. The individuals that you interview will be excellent sources for both locating existing documentation and checking its accuracy. Figure I.10 is an example of a portion of a properly documented job analysis.

2.8 Consolidate Data



At this point in the job analysis, you may have a large number of lists of duties, tasks, elements, etc. This information probably was obtained from a number of individuals at several locations by different members of your job analysis team. Now, you must combine these individual job analysis reports into one master report. If all of the reports are basically identical, you will have little difficulty in consolidating the data. If there are major differences between some of

JOB DATA WORKSHEET

JOB TITLE Medical Corpsman (91A10) DOS ______ PAGE NO. 1

DUTY/CODE Applying first aid (A) LEVEL ______ DATE 4/3/1975

ITEM CODE	TASK, ELEMENTS, J.P.M.	CONDITIONS	INITIATING CUES	STANDARDS	NOTES
A-001	Task: Perform first aid measures for drowning.	Performed in all climatic conditions generally outdoors, in all atmospheric conditions including toxic atmospheres. In a non-toxic atmosphere, a pharyngeal airway device, if available, may be used in administering artificial respiration. In a toxic atmosphere, the M1 resuscitation tube may be used with the M17A1 field protective mask to administer artificial respiration. Mouth-to-mouth, mouth-to-nose, and mask-to-mouth methods require a high degree of respiratory endurance.	Casualty is unconscious and is not breathing. There may or may not be a slight pulse.	All steps listed below performed in order listed and to standard listed for each step.	Detailed information listed in FM-21-11. SOP is to begin external heart massage and resuscitation procedures even when there is no pulse.
	ELEMENTS:				
A-001-001	Position casualty on his back.	Casualty may have other minor or serious injuries.	Same as A-001.	Victim should be immediately repositioned on back without further injury. Movements must be made carefully but quickly.	Severe bleeding from other injuries requires attention concurrent with attempt to restore breathing, but (con't)

FIGURE I.10: Example of A Completed Job Data Worksheet

JOB DATA WORKSHEET

JOB TITLE 91A10 DOS ______ PAGE NO. 2

DUTY/CODE (A) LEVEL ______ DATE 4/3/1975

ITEM CODE	TASK, ELEMENTS, J.P.M.	CONDITIONS	INITIATING CUES	STANDARDS	NOTES
					should not be started prior to resuscitation. If other assistance is available, it may be utilized. Care taken to minimize aggrevating other injuries.
A-001-002	Determine whether there is a pulse.	Same as A-001-001. Locate an uninjured area to take pulse if casualty has injuries.	Casualty is unconscious.	Breathing must be reestablished within three minutes.	The shortage of oxygen to the brain usually becomes severe after three minutes, which shortly results in brain damage.
A-001-003	Select method of resuscitation.	Same as A-001.	Toxic atmosphere requires use of mask-to-mouth method. Non-toxic atmosphere and existence of jaw or mouth wounds indicate mouth-to-nose method. (con't)	Correct method, based on cues, must be determined immediately.	Severe facial injuries or absence of M17A1 mask or M1 tube, may make selection of method somewhat arbitrary.

FIGURE I.10: Example of Completed Job Data Worksheet (continued)

JOB DATA WORKSHEET

JOB TITLE 91A10 DOS PAGE NO. 3

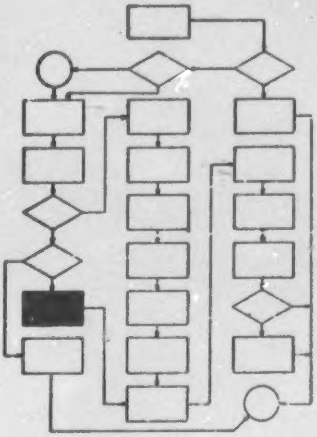
DUTY/CODE (A) LEVEL DATE 4/3/1975

ITEM CODE	TASK, ELEMENTS, J.P.M.	CONDITIONS	INITIATING CUES	STANDARDS	NOTES
			Mouth-to-mouth method indicated if non-toxic atmosphere and no jaw or mouth wounds.		
A-001-004	Clear casualty's airway.	Same as A-001.	Standard operating procedure.	The removal of foreign matter from the victim's mouth should take no more than 1-5 seconds since little time should be lost in getting air into the casualty's lungs.	Dentures, vomitus, mucus, or other foreign matter must be pulled foreward, and his head tilted back. Ideally, this procedure should take no more than 2 seconds.

FIGURE I.10: Example of Completed Job Data Worksheet (continued)

the lists, your decisions will be considerably more difficult to make. You may need to use additional Subject Matter Experts (SMEs) to resolve some of the conflicts. Management decisions may have to be made to resolve differences in the job as actually performed by job incumbents and the job as envisioned by their supervisors. You may have to recontact some of the individuals who were interviewed, to clarify statements or gather new information. The end product must be at least a tentative consolidated statement of the overall job.

2.9 Verify Task Inventory



As you will note on the flowchart in Figure I.5, this section appears to be somewhat out of sequence. If, in Section 2.2, you chose the on-site interview plan, this section is not what you should do next. Much of what you have been doing up to this time is collecting data and constructing a task inventory or list. One reason you chose the on-site interview plan was because you did not already have available a good task inventory. If you had, you might have chosen the survey plan instead. The first step in the survey plan is to verify the task inventory. After that, the two plans are basically similar. Therefore, we will pause here to discuss verifying the task inventory, and then we will continue to discuss the remaining steps for both plans.

How much effort needs to be put into verifying an existing task inventory depends upon:

1. the complexity of the particular job,
2. when the existing task inventory was made or when it was last updated,
3. how much the particular job is likely to change over time, and
4. the basis for the existing task inventory: what method was used to collect the information.

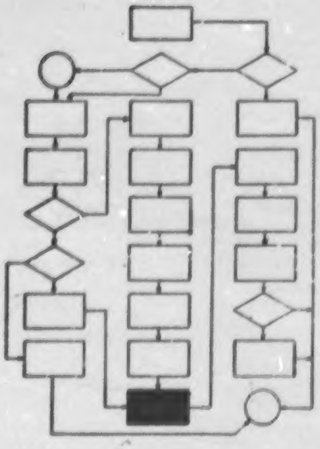
In the next several sections, you will be sending your task inventory to a large number of people. A considerable amount of time and money will be spent finding out more about the tasks on your inventory. Therefore, you want to take all reasonable steps to make sure the list is as accurate as practical before you send it out to possibly hundreds of people.

Probably the best way to verify the existing task inventory is to use the Jury-of-Experts approach. This method is discussed in Section 2.2 of this block.

The primary concern of the verifying process is to make sure:

1. all tasks performed by all levels of personnel who do the job are included in the task list, and
2. the task statements are worded so that individuals surveyed for additional information will understand what is meant by the statements.

2.10 Prepare Survey Questionnaires



The information you gather with the survey questionnaire may be massive, repetitive, and could in some cases be stored in a computer for ease of manipulation and retrieval. Whether or not a computer is used, you should know just what kinds of data you will need and where the data will be used. Collecting useless data and storing it in a form that cannot be used are common problems arising when the data purposes are not understood. The type and quantity of collected data should be determined by your specific needs.

The next several steps deal with making sure beyond any reasonable doubt that your task list correctly reflects the real-world job. You are going to accomplish this by sending questionnaires to a large number of people who know about the job and by reviewing the returned data to see if they verify the accuracy of your task list. This is called validating the task inventory. The first step is to design the questionnaire forms.

The details of the forms you use will be determined by:

1. how you will tabulate and summarize results, and
2. what information you wish to collect.

How you will tabulate and summarize results will be determined by whether you have available a computer and other automated data handling equipment and by the number of people to be surveyed. To determine what information you wish to collect, you should first consider what information you need to collect to meet the requirements of this block. These data requirements are:

1. Identifying information about the individuals being surveyed
2. Identifying tasks that are on the task list but are not performed
3. Listing any tasks that are performed but are not on the task list
4. Identifying any task statements that are incorrectly stated, and recommending revisions

In addition to the above, you may wish to collect information such as:

1. Data needed to determine which tasks will be selected for training
2. Other management data that can be economically collected with the same survey

You will remember that we said earlier that you probably would want to collect at least part of the data required for Block I.2 at the same time and with the same questionnaires you use to collect data for this block. Block I.2 will help you determine what kind of information you will need to make decisions on which tasks to select for training.

Other management information often can be collected economically on the same survey forms as those required for the data in this block. While details of such management information is outside the scope of this model, one possible example is as follows.

EXAMPLE

> Management might wish to know which tasks are being performed by individuals with an eighth grade education and which tasks are being performed by individuals with a high school education. If both groups were found to perform the same tasks, management might wish to reduce the entry requirements for that particular job.

One note of caution about the design of your questionnaire is that you should keep the questionnaire as short as practical. In general, the forms should be designed so they can be completed in two hours or less. One way you can save time on a complex task inventory is list all tasks under their appropriate duty title. This will permit the interviewees to rapidly scan groups of tasks that he does not perform and then proceed to the next duty.

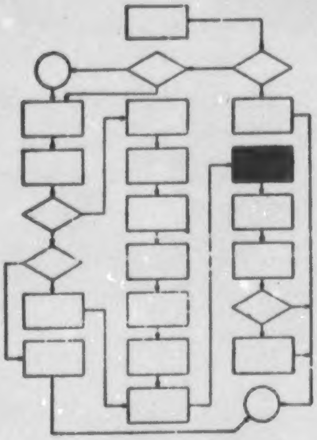
EXAMPLE

> A mechanic who works full-time in the shop knows without reading them that none of the tasks under the duty heading, "Performing engine conditioning on the flight line," apply to him.

A sample form for collecting identifying information was shown in Figure I.7. Appendices C and D, pages 100-104, are examples of forms that might be used to collect data for validating the task list. (Both forms also include some information for making training decisions. This will be discussed in the next block.) The forms in Appendix C are for hand recording information, while those in Appendix D are for machine recording and summarizing.

In addition to the preceding, you also will need to prepare detailed instructions for completing and administering the questionnaires. An example of such instructions is included in Appendix E, page 106.

2.11 Select Survey Sample

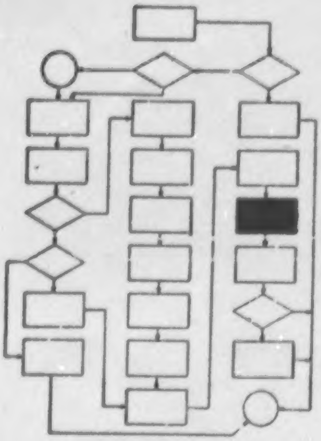


As a general rule your survey sample should be as large as possible. This is particularly true if you do not have personnel available with the responsibility and authority to assure that most of your questionnaires will be completed. With appropriately designed questionnaires, computer programs can easily analyze returns from thousands of individuals.

The first step in determining the individuals to be surveyed is to find out the total number of people in the service being surveyed who are assigned to the particular job being analyzed. Personnel offices of each service maintain such records. An attempt should be made to obtain a sample of at least 3000 individuals. If there are fewer than 3000 individuals available, a 100 percent sample should be used. If more than 3000 are assigned to a job, those selected for the survey should be representative of the whole.

You should make an attempt to obtain a sample that represents the distribution of individuals in the job according to command and skill level as it exists in the service. By using representative samples, the survey results can be interpreted as reflecting an accurate picture of the job as a whole. Review of personnel records, either by personnel employees, members of your job analysis team, or your field representatives who will conduct the survey, will be required to obtain data upon which to base choices for your survey. Section 2.5 of this block gave guidelines for selecting individuals for interviews. These same guidelines are suitable for selecting your survey sample.

2.12 Conduct Questionnaire Survey



Before sending out the total number of questionnaires you intend using, you may wish to first send out a small number. This will permit you to check the initial results and possibly make some changes in your questionnaires or instructions. Then you will send out what you hope will be the total number of questionnaires required.

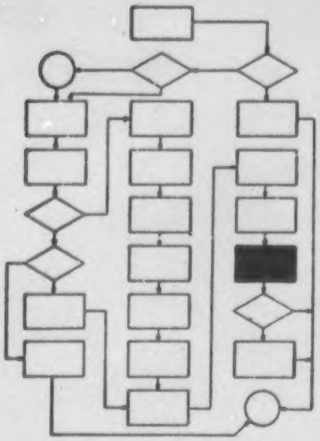
The ideal way to administer questionnaires is group administration. Where the local responsible official and his assistants schedule the administration, make certain that only eligible individuals are seated in the administration area, read the administrative directions, and provide any necessary assistance in completing the questionnaires. The local official then returns the completed questionnaires to the sending authority.

Often, particularly with individuals at remote stations, group administration is impractical. In these cases, it is sometimes effective to send the questionnaires to a responsible officer and request that he return them by a reasonable suspense date. Careful attention should be paid to the instructions for administration or self-administration. If the sending command has no authority to require that a suspense date be met, they must either obtain the concurrence of a command with that authority or be willing to accept a reduced percentage return.

How much confidence can you have in the validity of your questionnaire if you get less than a 100 percent return? Less and less confidence can be expected with each reduction in the percentage returned. However, if you only intend to use the questionnaires to find out whether the individuals perform the tasks, you will be able to tolerate a lesser percentage then if you intend to collect all useful information from your respondents. If your questionnaires are highly reliable (that is, if most respondents tell you pretty much the same thing regardless of specific location or command), you can have more confidence. For example, if all your questionnaires came from shore stations and half your DOS is at sea, you would have much less confidence in the validity of the results. Your confidence can increase as the spread of returns covers all important stations, locations, missions, and levels of the DOS.

What can you do if you are not satisfied with the percentage of returns of the questionnaires? You can send out more forms to different people and hope for better results; you can recontact some of the first sample and try to encourage them to return the questionnaires; and you can visit a random sample of those who did not respond and compare their forced responses with the voluntary responses. Then you and your supervisors will have to decide how much chance you are willing to take that the data you have received presents a sufficiently accurate picture of the job as it really exists.

2.13 Revise Job Data as Required



Evaluation of the survey data collected in the above block will show that:

1. Your task list was perfect; everyone agreed with it 100 percent. Or,
2. At least some individuals indicated at least some discrepancies in your task list.

If your task list was considered perfect, you are ready to move on to the next section of this block. However, most likely someone somewhere disagreed with you. The area of disagreement could be any or all of the following:

1. Some tasks on your list should be deleted.
2. You left off some tasks. Some new ones need to be added.
3. Some of the tasks you listed were incorrectly stated and should be rewritten.
4. Some duty statements were incorrectly listed, or some tasks were listed under the wrong duty.

Since these four items probably represent most of the probable changes, this section will discuss how to deal with each discrepancy.

First, even if practically everyone said certain tasks should be deleted, you should be hesitant to do so. At this point it is better to include tasks that individuals disagree on rather than to exclude them. These tasks would not be listed in the first place if someone somewhere did not consider the disputed tasks a part of the job. One exception to this is if you have listed two or more task statements that are actually the same task. In this case, you will want to delete all but one of the task statements and possibly restate the remaining one,

Item 2 on the preceding page is a more serious matter. You want to be sure not to exclude any tasks that are a legitimate part of the job. If the suggested new task clearly is not a part of the job, you should reject the suggestion that you include it. An example of this is:

EXAMPLE

> A postal clerk claims some tasks that should be added are "replace burned-out light bulbs" and "repair truck used to deliver mail." While you cannot deny the possibility that some postal clerk somewhere actually performs these tasks, neither task has any relationship to the job of postal clerk.

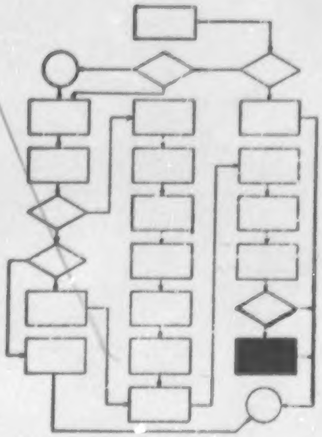
The tasks in the above example are parts of other jobs, and unique circumstances sometimes require an individual, at least temporarily, to do part of someone else's job. You should not include such tasks in your list.

However, if as many as perhaps 5 percent of the respondents indicate that a certain task should be added, if these individuals are fairly representative geographically, and if the nature of the task is such that it could be a part of the job, you probably should include it. Remember that if the task is relatively insignificant, it probably will be screened out in Block I.2: SELECT TASKS/FUNCTIONS.

The same general statements as above can be made for suggestions that certain tasks or duties are incorrectly stated or that certain tasks are listed under the wrong duty. Remember that, since you have identifying information from each respondent, you can recontact him in person, by telephone, or by correspondence. You can determine if his information is correct and base your decisions partly on the credibility of the respondents.

In the final analysis, the consolidated list should be acceptable to you and your command. While this does not mean you should make arbitrary decisions, it does mean you may not be able to completely please everyone. Document the decisions you are forced to make, give the reasons for your decisions, and move on to the next block.

2.14 Collect Other Required Job Information



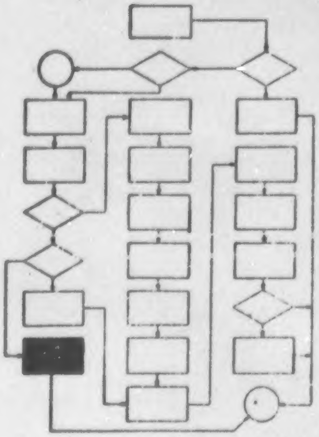
In Section 2.2 of this block, when you developed your data collection plan, you made a decision as to whether your initial data collection effort would be restricted to developing and validating a task inventory or if you would initially collect all required job information. If you made the latter decision, you will now have most of the conditions, initiating cues, standards, and elements for each task. However, if you have not yet collected this data or if you added new tasks in Section 2.13, you will need to continue with your job analysis effort. If you decided to select tasks for training in Block I.2, and then collect the additional data only for tasks selected for training, you will need to complete the procedures in Block I.2 and then come back to this point in this block.

Regardless of your original plan and what you have done up to this point you will need thorough documentation of conditions, initiating cues, standards, and elements for each task or at least for each task selected for training. While there are several possible ways to accomplish this, there is only one recommended way: Follow the steps outlined in Sections 2.3 - 2.8 for on-site interview collection of data.

If you still have to collect all of the required information about each task, this represents a sizable effort. If you have most of the data but have added several new tasks, the remaining effort will be a minor one. If all the required conditions, standards, elements, and such information still must be collected, at least you already have a good task list; and if you have selected tasks for training, you do not have as many tasks with which to work.

When you complete this final effort, you are ready to check the formal documentation requirements of 3.0 of this block and then move on to Block I.2 (or I.3 if you have already selected tasks for training).

2.15 Carry Out Alternate Data Collection Plan



In Section 2.2, we mentioned that you might, because of some situations or constraints, develop some data collection plan for an existing job, other than the two major plans we have emphasized. Two major reasons for an alternate choice were:

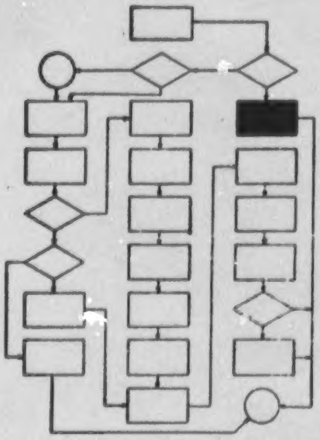
1. Only relatively minor changes have been made in the job. The extent of the changes does not justify extensive on-site interviews and questionnaire surveys.
2. Time, cost, or other management constraints dictate that you accept a less-than-ideal approach.

For the first situation, or other similar situations, a Jury-of-Experts or the group interview approach might have been chosen. Following this with a small questionnaire survey should give good assurance that your data is essentially correct.

If the second situation is your reason for developing an alternate plan, we cannot, of course, argue with your doing the best you can with what you have to work with. However, if you cannot afford to follow the recommended procedures, your probability of obtaining good results is considerably reduced. Our only suggestion here is that, if you cannot follow the recommended procedures, the credit--or blame--for the resulting training program should not be laid on the recommended procedures!

2.16 Analyze New Job

If the job you are analyzing is a new job (that is, no one does the job now), most of the analysis techniques we have discussed so far will be of little assistance to you. Conducting on-site interviews with or sending questionnaires to individual job incumbents, or holding group interviews with job incumbents can be useful only to the degree that the new job resembles a job that already exists.



For the new job, you may initially have no job data at all. And you may have no opportunity to see the job in actual operation. But in spite of these limitations, it still may be necessary to have a training course ready in time to begin training before the new system or equipment is put into operation.

Ideally, as jobs are envisioned as part of a new operational concept or of new equipment systems, the job analysis teams are notified; and they become a part of the development activity. In this way the required work activities within the new system can be documented and translated into job analysis data as the system develops. This serves in two important ways:

1. If the system concept is developing a "people" requirement that is impossible to fulfill, this fact can be announced and the system can be modified.
2. The documented job analysis data can be the basis for training programs that will develop graduates to coincide with the introduction of the new system in the field. This also increases the likelihood, in the equipment-oriented areas, of early introduction of the equipment into the training program.

Regardless, however, of the point in time that you become involved in the new program, the data collection method you use will be largely determined by whether the new job to be analyzed is equipment-oriented or non-equipment oriented. And one essential resource that you have on your team is the Subject Matter Experts (SMEs) in systems or equipment similar to that involved with the new job you are analyzing.

2.16.1 Non-Equipment-Oriented Jobs

The beginning point, when analyzing a new non-equipment-oriented job, is to review the available information. Since a management decision has been made to establish the new job--otherwise, you would not have been assigned to analyze it--someone, somewhere has at least a general idea of what the new job will be like. Most likely this information is documented and available for your use. Analysis of this information may show the new job to be a regrouping of a variety of tasks that are presently being performed in other closely related jobs, with some new tasks added.

EXAMPLES

1. A new job of Stock Control and Accounting Specialist might include many tasks presently performed by Automotive Repair Parts Specialists, Aircraft Repair Parts Specialists, and Communications-Electronics Repair Parts Specialists. The new tasks might be operation and control of a computer-managed inventory control system.
2. A new job of Infantryman, On-Leash Scout Dog Handler might include most of the same tasks performed by other Infantrymen, but in addition it includes scout dog handling and dog obedience training.

Once you identify, at least tentatively, the tasks that are already performed in similar jobs, you can analyze that part of the new job by:

1. locating and reviewing existing job analysis data for those tasks, or
2. if the above documentation does not exist, is incomplete, or is outdated, conduct on-site interviews with individuals who perform and individuals who supervise the tasks.

For the new tasks, you will have to look further for appropriate information. Most likely you will find that similar tasks are performed somewhere by someone. Very few things in the world are completely new. You will have to gather data for the new tasks from the best available sources: other services, other government agencies, or private industry. You and your Subject Matter Experts (SMEs) may have to make some assumptions about the tasks that may later prove to be wrong. In any case, your data will not be totally valid until analysis is done on the job after the operation begins.

2.16.2 Equipment-Oriented Jobs

The armed services rarely, if ever, can afford to wait until new equipment arrives before beginning training for use and maintenance of the new equipment.

EXAMPLE

> When the new B1 Bombers arrive, or very shortly thereafter, someone must be trained to fly them, someone must be able to operate the new electronic equipment, and someone must be trained to maintain the bomber and all its equipment.

Most new or advanced systems are really the second or third generation of existing equipment. New jobs such as operating or maintaining the new equipment are somewhat similar to operating or maintaining the old equipment. Data obtained for jobs on the old equipment can be used as a basis for analyzing the new job. Analysis of an equipment-oriented job depends heavily on a clear understanding of the new equipment. This is the major reason for having SMEs on your team who are thoroughly familiar with similar equipment. They are much more likely to understand how the new equipment is different and, thus, how the tasks that make up the new job will be different.

In some cases, you can gather data from parallel work being done for other purposes.

EXAMPLES

1. An equipment contractor usually collects data for engineering validation of his equipment prior to production. These validation data often contain information applicable to the new equipment-oriented job you are analyzing.
2. When the contractor begins testing prototype equipment, there should be opportunity for the job analyst to bring appropriate military subjects to the factory site and let them sit in on the tests. The use of the typical military operator would certainly be beneficial to the contractor in his tests and would provide an opportunity for the job analyst to observe and document job performance requirements.
3. Observation of assembly techniques on the contractor's assembly line and observation of final equipment check-out procedures can provide data on operation and maintenance of the equipment.

Sometimes simulation may be used to obtain critical information. At other times, you and your SMEs will have to "think through" the tasks in an attempt to define or predict the required behavior of the man on the job who will use the equipment. Your team must obtain as much early task data as possible, and you must be willing to change the task list as more data become available. Even at best you will end up with incomplete information. The more complex the equipment, the more errors are likely to occur in your job analysis.

As with analysis of existing jobs, the analysis of a new job should result in a list of tasks that make up the job as well as the conditions, initiating cues, standards, and elements that make up each task. However, as we noted earlier, the data for this new job will not be totally valid until analysis is done on the job after the new equipment is put into use. Typically, there is at least a 25 percent change in the new job after the first year of operation.

3.0 OUTPUTS

Completion of the procedures discussed in this block, and in all the other blocks in the model, will result in several tangible products. These products are a result of what you did in each block of the ISD model. In addition to these products, another very critical part of the ISD process is the formal documentation of significant decisions, activities, and problems produced or encountered in each block of the model. Not only what you did, but also why, when, and how you did it are important and must be documented. Some reasons for this formal documentation are:

1. You need to show your supervisor and others what you plan to do and why, when, and how you intend doing it. And then, as you carry out the plan, you need to report on your progress to your supervisors and others. They are responsible for monitoring your performance. For them to do this, they must have adequate inputs from you.
2. If you end up producing exceptionally good--or exceptionally poor--training, others involved in developing training have a right to know how you did it. Over a period of time, you are going to forget many things; you need to document as you go along.

3. A major factor in deciding whether someone else's training program, the use of which would result in considerable savings, is suitable for your needs is understanding how the program was developed. How did they develop tests? Is it the same way you would have done it? Or did they do it better than you would have? What criteria did they use to select tasks for training? Was their criteria similar to what you think is important? How did they validate their program? How did they go about analyzing the job? These are just a sample of questions for which you would need answers before you adapted someone else's program to meet your training needs. Remember, if you want these kinds of information from others, you should be willing to provide it for courses you develop.
4. The ISD process is a repetitive process in that what you do or what happens in one block may require you to go back and do some things differently in earlier blocks. If you have not documented how you did it the first time, you may not know how to do it differently the next time.
5. A number of individuals are generally involved in an ISD effort to develop a single course of instruction. You may do only the job analysis and then turn the program over to another group. In order to continue with the orderly development of the program, each new individual or group needs to know not only exactly what has been done before but also why and how it was done.

The total output of each block, then, is both the product that the procedures are designed to produce and the formal documentation prepared, while carrying out these procedures, that permits others to understand the series of decisions and events that shaped your final products. A list will be given at the end of each block of this total output required from that block.

The outputs of Block I.1: ANALYZE JOB should consist of the following:

3.1 Products

1. Definition of the job (See example, page 86.)
2. A validated task list (See example, page 86.)
3. Conditions, cues, standards, and elements for each task (See Figure I.11 for an example.)

3.2 Other Documentation

1. Statement of rationale for conducting a job analysis
2. Details of data collection plan, including rationale for the plan and scheduled completion dates for each major step in the plan
3. Details of actual data collection. These should include:
    a. Any deviation from the plan and reasons for the deviations
    b. Copy of questionnaires
    c. Summary statement of questionnaire results
4. Any other pertinent job analysis information not included in the above

EXAMPLE

Definition of the job:

The job of an OH-58 Helicopter Repairman includes inspecting, testing, servicing, adjusting, calibrating, installing, replacing, repairing, overhauling, and rebuilding any or all components of the OH-58 helicopter.

EXAMPLE

Validated task list:

A. Service oil system-main transmission.
   1. Inspect main transmission oil system.
   2. Perform maintenance operational check on transmission oil system.
   3. Troubleshoot transmission oil system.

B. Install main transmission.
   1. Install main rotor swash plate.
   2. Install main rotor swash plate support assembly.
   3. Install main rotor hub.
   4. Repair main rotor pitch link assembly.

JOB DATA WORKSHEET

JOB TITLE OH-58 Helicopter Repairman DOS PAGE NO. 1

DUTY/CODE Disassemble Tail Boom (A-1) LEVEL DATE 4/3/1975

ITEM CODE	TASK, ELEMENTS, J.P.M.	CONDITIONS	INITIATING CUES	STANDARDS	NOTES
A-001	Task: Remove tail rotor gear box.	In a maintenance work area, using OH-58 Helicopter, TM 55-1520-228-20, general mechanics tool kit, maintenance platform and DA Form 2408-13.	Improper tail rotor performance: insufficient speed, grinding noises, fluid leaks, output shaft out of round. Or, as part of routine overhaul or inspection.	The student must remove the tail rotor gear box in accordance with TM 55-1520-228-20. All required entries must be recorded on DA Form 2408-13.	Detailed information listed in TM 55-1520-228-20.
	ELEMENTS:				
A-001-1	Disconnect electrical lead from chip detector.	Same as A-001	Decision has been made to remove tail rotor gear box on basis of A-001.	Same as A-001	Read chip detector before disconnecting electrical lead.

FIGURE I.11: Example of Documentation of Conditions, Cues, Standards and Elements of a Task

APPENDIX A

EXAMPLE OF DOCUMENTATION OF TASK CONDITIONS

APPENDIX A

EXAMPLE OF DOCUMENTATION OF TASK CONDITIONS

Job: Manual Central Office Repairman (MOS 36G20)

Task: Troubleshoot Telephone Set TA-312/PT.

Job Task Conditions: See Standard job task conditions, level II. In particular, repairman uses TM 11-5805-201-35, Tool Equipment TE-49, a second Telephone TA-312/PT, and two-conductor wire to perform checks.

Job Task Standards: TM 11-5805-201-35, paragraph 3-3, outlines accurate standards; experienced repairman requires 20 minutes or less to complete checks.

Standard Job Task Conditions: Manual Central Office Repair, MOS 36G20

Level I - Organizational Maintenance

1. General. Organizational maintenance is performed at the location where manual central office telephone equipment is installed or stored. It consists of checks and services performed at scheduled intervals, following procedures outlined in technical manuals. It also includes limited troubleshooting, pluckout parts replacement, and minor adjustments as authorized in pertinent maintenance allocation charts. Specified maintenance forms are completed during maintenance.

2. Tools, equipment, and clothing: Tools and equipment specified in tool allocation charts are used or their equivalents contained in specific TOE. No special clothing is required.

3. Job aids and manuals. Ther pertinent equipment technical manuals are always available and other publications referenced in technical manuals are usually maintained by each organization.

4. Environment. Normally, organizational maintenance is performed under protective shelter, but occasionally repairs are performed outside. Gloves and heavy clothing may hinder performance during cold weather. Required power may be provided by batteries, portable generators, or commercial facilities.

5. Special physical demands. Outside repairs are performed in hot, cold, or wet weather conditions. Emergencies may require longer workdays than the twelve hours normally required in combat zones. All tools, test equipment, and spare parts must be moved to the equipment being repaired.

6. Supervision and assistance. Usually available for newly assigned job holders.

Level II - Direct Support (DS) Maintenance Shop

1. General. DS maintenance may be performed in a sheltered AN/MSM-16 portable shop that houses necessary test equipment, replacement parts, required power connections, and a workbench area suitable for two repairmen. Maintenance up to and including piece-part repair is performed on major items, assemblies, and subassembles. Operator preventive maintenance is also performed on test equipment.

2. Tools and test equipment.

a. In addition to items normally mounted in shelter, Test Set TS-140/PCM, Multimeter TS-352/U, Test Set TS-716/U, Electron Tube Test Set TV-7/U, Test Set I-181, Test Set TS-183/U, Tool Equipment TE-49, and special telephone repair tool kits are included in each shelter.

b. All portable test equipment is used both in the shelter and for onsite repairs after which it is returned to the shelter.

3. Job aids and manuals. A minimum of two sets of technical manuals for most manual central office telephone equipment is available in each DS shelter.

4. Environment. Except for repairs on bulky AN/TTC-7 equipment and permanently mounted mobile units, all work is performed in the shop shelter. A shelter may be located singly or several shelters may be grouped for large maintenance operations.

5. Special physical demands. In addition to the crowded working conditions in each shelter, a 12-hour workday is considered normal in combat zones with emergencies requiring additional time.

6. Supervision and assistance. Usually available for newly assigned jobholders.

Level III - Direct Support Maintenance Onsite

1. When equipment cannot be repaired by organizational maintenance personnel and the equipment is too bulky to be easily moved, direct support personnel perform maintenance onsite. Generally, onsite DS repair is limited to direct exchange of assemblies although some systems maintenance and piece-part repair is also performed.

2. DS personnel travel to the site in a truck and carry their own tools and test equipment with them. Replacement parts and assemblies are also transported from the shelter to the site. Therefore, DS repairmen must estimate probable malfunctions from information provided by the using organization and select the proper tools and test equipment that must be transported.

3. Job aids, environmental conditions, and physical demands are the same as for organizational maintenance, Level I.

4. Onsite DS repairmen work without direct supervision but are assisted by organizational personnel. In most cases, only experienced repairmen perform onsite maintenance.

Level IV - General Support (GS) Maintenance Shop

1. General. GS maintenance is performed in a permanent building which houses all necessary tools, test equipment, replacement parts, workbenches, and required power connections. Immediately outside the building is a hardtop surface used for the repair of mobile equipment. The shop is usually divided into six distinct areas--shipping and receiving, prerepair inspection, troubleshooting and repair, quality control, parts and storage, as well as the administration office and technical library. With the exception of large mobile units, all equipment enters the shipping and receiving area as a major item, assembly, or subassembly. From the receiving area all equipment is sent to the prerepair testing area where decisions are made to either repair the equipment, send it to depot for rebuild, or salvage it. Equipment to be repaired is then sent to the troubleshooting and repair area. Repaired equipment is

sent to the quality control area where general support final tests are performed. Equipment meeting final test standards is outprocessed and either sent back to the using unit or placed in storage for future use. Large mobile units are parked on the hardtop outside the shop and repairs and final tests are performed within the mobile unit. Required maintenance and shop records are filed in the mobile unit. Necessary maintenance and shop records are filed in the shop administrative office.

2. Tools and test equipment. All tools and test equipment normally available at organizational and direct support maintenance level are also available in the general support shop. Moreover, the GS shop includes any tools and test equipment required for general support testing.

3. Job aids and manuals. All pertinent technical manuals are available in the GS shop as well as numerous test-jigs and interconnecting cables required for efficient troubleshooting and final testing.

4. Environment. Most general support maintenance is performed in the shop. The repair of mobile units may expose the repairman to weather but the work can usually be scheduled so weather causes no problems.

5. Special physical demands. No special physical demands are made on the incumbent working at GS level.

6. Supervision and assistance. Both supervision and assistance are always available at the GS level.

APPENDIX B

SOURCES OF TRAINING COURSES, INSTRUCTIONAL MATERIALS, JOB ANALYSIS DATA, AND JOB INFORMATION

APPENDIX B

A. SOURCES OF TRAINING COURSES AND INSTRUCTIONAL MATERIALS

AIR FORCE

Extension Institute Catalog and Guide. ECIRP 50-1. Extension Course Institute Air University, Gunter Air Force Station, Alabama. 1974.

Instructor's Guide to Survival Training Films. ADTIC-PUB-G-111. Arctic-Desert-Tropic Information Center, Air University, Maxwell Air Force Base, Alabama.

Mather Air Force Base Learning Center Catalog. Headquarters, 323d Flying Training Wing, Mather Air Force Base, California, 95655. 1973.

USAF Formal Schools Catalog. AFM 50-5. Headquarters, U.S. Air Force, Washington, D.C., 20330. 1973.

Note: Additional Sources comprise USAF Study Reference Lists, Specialty Training Standards, and Career Development Courses.

ARMY

Announcement of U.S. Army Correspondence Courses. DA PAM 351-20. Headquarters, Dept. of the Army, Washington, D.C.

Army Correspondence Course Program. DA PAM 350-2. Headquarters, Dept. of the Army, Washington, D.C. 1973.

Index of U.S. Army Motion Pictures. DA PAM 108-1. Headquarters, Dept. of the Army, Washington, D.C.

Interservice Formal School Training for DOD Civilian and Military Personnel. Army Regulation 351-9. Dept. of the Army, Washington, D.C.

USAFI Correspondence Courses. DA PAM 350-6. Headquarters, Dept. of the Army, Washington, D.C.

U.S. Army Formal Schools Catalog. DA PAM 350-10. Headquarters, Dept. of the Army, Washington, D.C. 1973

MARINES

Basic School Extension Catalog. Director, Extension School, Education Center, MCDEC, Quantico, Virginia, 22134.

Marine Corps Formal School Catalog. MCO-P1500.12F. Headquarters, United States Marine Corps, Washington, D.C. 1973.

Marine Corps Institute Handbook (12th Edition). MCO-P1550.1H. Director, Marine Corps Institute, Marine Barracks, Box 1775, Washington, D.C. 1973.

NAVY

Catalog of Navy Training Courses (Vols. I,II, and III). NAVEDTRA 10500. Chief of Naval Education and Training Support, Pensacola, Florida, 32508. 1974.

Documentary Film Catalog (Revision #1). NWC-TP-4784-REV-1. Commander, Naval Weapons Center, Cuwa Lake, California, 93555. 1971.

Films on Oceanography. Catalog Series, NODC-C-4. U.S. Naval Oceanographic Data Center, Washington, D.C., 20390. 1963.

Motion Picture Catalog of Films Available Through the External Relations Group Motion Picture Project. TG-533A. Commander, Naval Air Systems Command, Washington, D.C., 20360. Attention: AIR-604A1. 1966.

OTHER FEDERAL GOVERNMENT SOURCES

Educational Resources Information Center (ERIC), National Center for Educational Communication, 400 Maryland Avenue, Southwest, Washington, D.C., 20202.

National Referral Center for Science and Technology, Library of Congress, First and Independence Avenue, Southeast, Washington, D.C., 20540.

Report Bibliography. Defense Documentation Center, Defense Supply Agency, Cameron Station, Alexandria, Virginia, 22314.

U.S. Government Films: A Catalog of Motion Pictures and Filmstrips for Sale by the National Audio Visual Center. National Archives Publication No. 70-3. National Archives, Washington, D.C.

OTHER GENERAL SOURCES

Directory of Educational Information Resources. Com Information Corporation, New York, 1971.

ERIC Document Reproduction Service (EDRS). Leasco Information Products, 4827 Rugby Avenue, Bethesda, Maryland, 20014.

ERIC Clearinghouse on Educational Media and Technology. Institute for Communication Research, Stanford University, Stanford, California, 94306.

Educator's Purchasing Masters (Vol. I). Instructional Materials, Fisher Publishing Co., Englewood, Colorado. 1971.

New Educational Materials 1970. Citation Press, New York. 1970.

B. SOURCES OF JOB ANALYSIS DATA

AIR FORCE

Comprehensive Occupational Data Analysis Program (CODAP)

The Job Specialty Survey Division Reports, Lackland AFB, Texas

Occupational Survey Reports, Occupational Measurement Center, Lackland AFB, Texas

The Personnel Research Laboratory Reports, Lackland AFB, Texas

ARMY

Military Occupational Data Bank

NAVY

Navy Occupational Task Analysis Program (NOTAP)

C. SOURCES OF INFORMATION ABOUT PARTICULAR JOBS

Classification manuals which contain official descriptions, such as: AFM 39-1, Airman Classification Manual; AFM 36-1, Officer Classification Manual

Field manuals which contain doctrine, tactics and techniques

General Guides which include related sources, such as Air Force regulations in the 0-series:

AFR 0-1, Guide to Indexes, Catalogs and Lists of Departmental Publications

AFR 0-2, Numerical Index of Standard Air Force Publications

AFR 0-6, Subject Index of Air Force Publications

AFR 0-9, Numberical Index of Departmental Forms

Job descriptions such as the Officer Grade Requirements and Job descriptions reported by individual Air Force officers

Logistic support plans which indicate materials and services associated with weapon systems

Maintenance allocation charts which designate authorization to perform maintenance tasks

Manuals which explain equipment or systems

Military writings such as tactical reports, historical records, and reports of maneuvers and field tests

Modification work orders which furnish instructions for alterations and modifications to material

Regulations which state policies, responsibilities, and administrative procedures

Standard operating procedures which provide actual job performance requirements

Tables of organization and equipment (TOE) and tables of distribution and allowance (TDA) which include information on position titles, job distribution, supervision, and equipment

Technical manuals and bulletins which cover equipment operation and maintenance procedures

APPENDIX C

SAMPLE OF A HAND SCORABLE QUESTIONNAIRE

JOB INVENTORY (DUTY-TASK LIST)	AFSC 921X0/922X0	Page 7 of 44 Pages

1. Check tasks you perform now (✓).
2. Add any tasks you do now which are not listed.
3. In the "Time Spent" column, rate checked (✓) tasks on time spent in your present job.

Time Spent Scale

1 – VERY MUCH BELOW AVERAGE	4 – ABOUT AVERAGE	7 – VERY MUCH ABOVE AVERAGE
2 – BELOW AVERAGE	5 – SLIGHTLY ABOVE AVERAGE	
3 – SLIGHTLY BELOW AVERAGE	6 – ABOVE AVERAGE	

C. FITTING AND MAINTAINING LIFE RAFTS AND PRESERVERS		✓ CHECK IF DONE IN PRESENT JOB	TIME SPENT DOING THESE TASKS IN PRESENT JOB
1. Clean life preservers	42		
2. Clean life rafts	43		
3. Condemn non-reparable life rafts or life preservers	44		
4. Fit life preservers	45		
5. Inspect life preservers	46		
6. Inspect life raft accessories	47		
7. Inspect life rafts	48		
8. Inspect or weight test carbon dioxide (CO_2) cylinders or cartridges	49		
9. Make entries on or review Life Preserver Data forms (AFTO Form 466)	50		
10. Make entries on or review Life Preserver Inspection Data Record forms (AFTO Form 336)	51		
• • • • • • • • • • •			
11. Make entries on or review Life Raft Inspection Record forms (AFTO Form 337)	52		
12. Make entries on or review User Certification Label forms (AFTO Form 27)	53		
13. Pack life preservers	54		
14. Pack life raft accessory containers	55		
15. Pack life rafts	56		
16. Perform functional tests of life preservers	57		
17. Perform functional tests of life rafts	58		
18. Perform inflation tests of life preservers	59		
19. Perform inflation tests of life rafts	60		
20. Perform minor repairs to life preservers such as patching rips, tears, or holes	61		
• • • • • • • • • • •			
(Continued next page)			

JOB INVENTORY (DUTY-TASK LIST)	AFSC 921X0/922X0	Page 8 of 44 Pages

1. Check tasks you perform now (✓).
2. Add any tasks you do now which are not listed.
3. In the "Time Spent" column, rate checked (✓) tasks on time spent in your present job.

Time Spent Scale

1 – VERY MUCH BELOW AVERAGE	4 – ABOUT AVERAGE	7 – VERY MUCH ABOVE AVERAGE
2 – BELOW AVERAGE	5 – SLIGHTLY ABOVE AVERAGE	
3 – SLIGHTLY BELOW AVERAGE	6 – ABOVE AVERAGE	

C. FITTING AND MAINTAINING LIFE RAFTS AND PRESERVERS (CONTINUED)		✓ CHECK IF DONE IN PRESENT JOB	TIME SPENT DOING THESE TASKS IN PRESENT JOB
21. Refill CO_2 cylinders	62		
22. Send life raft compressed gas cylinders to other agencies for test, refill, or inspection	63		
23. Store life rafts or life preservers	64		

IF A TASK THAT YOU PERFORM IS NOT LISTED ANYWHERE IN THE ENTIRE LIST, WRITE IT IN THE BLANK SPACES BELOW.

APPENDIX D

SAMPLE OF A MACHINE SCORABLE QUESTIONNAIRE

UNIT CODE

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

PART III
NCOA
TASK INVENTORY

BOOKLET NUMBER

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

USE #2 PENCIL ONLY

Erase completely when making changes or corrections.

	A FREQUENCY OF TASK PERFORMANCE	B TIME BETWEEN JOB ENTRY AND TASK PERFORMANCE	C PROBABLE CONSEQUENCES OF INADEQUATE PERFORMANCES
	1 Never	1 Never Performed	1 Negligible
	2 Less than once per month	2 Performed after 90 days	2 Not very serious
	3 At least monthly, but less than twice per week	3 Performed within 90 days	3 Very serious
	4 Twice per week or more	4 Performed immediately	4 Extremely serious
I. Perform Organizational Support Activities			
A. Perform Company/Routine Administration	1 2 3 4	1 2 3 4	1 2 3 4
1. Prepare/Audit Morning Report (DA Form 1)	1 2 3 4	1 2 3 4	1 2 3 4
2. Verify Morning Report for Correctness/ Completeness	1 2 3 4	1 2 3 4	1 2 3 4
3. Make Corrections on Morning Report	1 2 3 4	1 2 3 4	1 2 3 4
4. Review Morning Report Extract for Correctness/Completeness	1 2 3 4	1 2 3 4	1 2 3 4
5. Prepare SIDPERS Input and Control Data Form (DA Form 3728)	1 2 3 4	1 2 3 4	1 2 3 4
6. Edit DA Form 3258 for Correctness/ Completeness	1 2 3 4	1 2 3 4	1 2 3 4
7. Receive/Process Incoming Personnel	1 2 3 4	1 2 3 4	1 2 3 4
8. Process Outgoing Personnel	1 2 3 4	1 2 3 4	1 2 3 4
9. Maintain Personnel Data Cards	1 2 3 4	1 2 3 4	1 2 3 4
10. Maintain/Use Personnel Information Roster	1 2 3 4	1 2 3 4	1 2 3 4
11. Recommend Subordinates for Decorations/ Awards	1 2 3 4	1 2 3 4	1 2 3 4
12. Process Casualty Reports	1 2 3 4	1 2 3 4	1 2 3 4
13. Process Congressional Inquiries	1 2 3 4	1 2 3 4	1 2 3 4
14. Prepare/Maintain Organizational/ Functional Charts	1 2 3 4	1 2 3 4	1 2 3 4
15. Prepare/Approve Sick Slips	1 2 3 4	1 2 3 4	1 2 3 4
16. Coordinate Leaves/Passes	1 2 3 4	1 2 3 4	1 2 3 4
17. Assist in Preparation for Inspections	1 2 3 4	1 2 3 4	1 2 3 4
18. Assist in Conduct of Inspections	1 2 3 4	1 2 3 4	1 2 3 4
B. Prepare Work Schedules	1 2 3 4	1 2 3 4	1 2 3 4

FG form 519 (TEST) 1 Feb 74

☆U.S. GOVERNMENT PRINTING OFFICE : 1974 780-206

UNIT CODE									
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

BOOKLET NUMBER									
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

USE #2 PENCIL ONLY

Erase completely when making changes or corrections

	A FREQUENCY OF TASK PERFORMANCE	B TIME BETWEEN JOB ENTRY AND TASK PERFORMANCE	C PROBABLE CONSEQUENCES OF INADEQUATE PERFORMANCES
	1 Never	1 Never Performed	1 Negligible
	2 Less than once per month	2 Performed after 90 days	2 Not very serious
	3 At least monthly, but less than twice per week	3 Performed within 90 days	3 Very serious
	4 Twice per week or more	4 Performed immediately	4 Extremely serious
B. 1. Make Work Assignments	1 2 3 4	1 2 3 4	1 2 3 4
2. Prepare Duty Roster (DA Form 6)	1 2 3 4	1 2 3 4	1 2 3 4
3. Maintain Duty Roster	1 2 3 4	1 2 3 4	1 2 3 4
C. Process Correspondence	1 2 3 4	1 2 3 4	1 2 3 4
1. Prepare Correspondence	1 2 3 4	1 2 3 4	1 2 3 4
2. Review Correspondence for Format/Grammar/Content	1 2 3 4	1 2 3 4	1 2 3 4
3. Correct Errors in Correspondence	1 2 3 4	1 2 3 4	1 2 3 4
4. Route Outgoing Correspondence	1 2 3 4	1 2 3 4	1 2 3 4
5. Receive and Distribute Incoming Correspondence	1 2 3 4	1 2 3 4	1 2 3 4
If a task that you perform is not listed, write it in the blank spaces below	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4
	1 2 3 4	1 2 3 4	1 2 3 4

FG Form 519 (TEST) 1 Feb 74

☆ U.S. GOVERNMENT PRINTING OFFICE 1974 750 206

APPENDIX E

INSTRUCTIONS FOR USE AND ADMINISTRATION OF QUESTIONNAIRE

APPENDIX E

INSTRUCTIONS FOR USE AND ADMINISTRATION OF QUESTIONNAIRE

TO THE NONCOMMISSIONED OFFICER:

This questionnaire is part of a field survey designed to identify tasks for military police training. Its specific purpose is to obtain from you, the Noncommissioned Officer, information on task criticality and frequency of performance. Feedback gained from this questionnaire will play a major part in redesigning the Noncommissioned Officer Advanced Education System. The ultimate goal is to design training so that it reflects what we have learned from you in the field. This goal is possible only with your full cooperation. Consider each task listed in this questionnaire carefully and give your best response. Your contribution is essential to a successful survey.

PART I

GENERAL INSTRUCTIONS

1. Complete this survey questionnaire within the time specified by your unit project officer and return it to him upon completion.

2. Because instructions for completing each part of this survey questionnaire are different, read all instructions carefully.

3. Part II requires that you supply biographical information. This information will be used to correlate feedback received from the field. Print all answers in the spaces provided on the appropriate survey questionnaire page.

4. In the upper fight corner of each page of Part III, Task Inventory, of this survey questionnaire is a BOOKLET NUMBER block. Immediately to the left of this block is the individual booklet number. Print the individual booklet number in the BOOKLET NUMBER block on each page of the Task Inventory as demonstrated in the example.

EXAMPLE:

(000345)

	BOOKLET NUMBER									
	0	1	2	●	4	5	6	7	8	9
	0	1	2	3	●	5	6	7	8	9
	0	1	2	3	4	●	6	7	8	9

5. Part III, Task Inventory, is divided into nine (9) separate sections (Sections I-IX). The content of these sections concerns tasks you may perform in your present duty assignment. You are asked to rate each task in accordance with three criteria - frequency of task performance, immediacy of task performance, and importance of task to mission success.

Base all selections on your experience in your present duty assignment.

a. Column A requires that you rate how often you perform each task on a scale from one to four. The criterion for this rating is the frequency of task performance. Those tasks performed most frequently will normally be rated four while those tasks not performed at all will be rated one.

b. Column B requires that you determine how soon you must be capable of performing each task after reporting to your present duty assignment. The criterion for this rating is the immediacy of task performance. Of the four possible responses, select the one most nearly describing your requirements. Select response number four for those tasks which you must be capable of performing immediately upon reporting for duty. Select response number one fortthose tasks which you never perform.

c. Column C requires that you describe, in your opinion, how important each task is to mission success. The criterion for this rating is the importance of the task to the accomplishment of the unit mission. Those tasks that, in your opinion, are most important to mission success will be rated four while those tasks that you consider least important will be rated one.

6. After selecting, enter your responses for each task, using either a pen or pencil, in the answer portion adjacent to the appropriate task statement as demonstrated in the example.

EXAMPLE: The task PREPARE CORRESPONDENCE, if rated as performed FREQUENTLY in Column A, identified as must be capable of performing IMMEDIATELY in Column B, and determined by you to be MOST IMPORTANT in Column C, would be entered in the answer portion, as shown below.

PREPARE CORRESPONDENCE	1	2	3	4	1	2	3	4	1	2	3	4
	☐	☐	☐	■	☐	☐	☐	■	☐	☐	☐	■

7. After each section of Part III, Task Inventory, is a Write-In Section. These write-in sections are provided in order that you may comment on each task inventory section, or list any task(s) you think should be included in the Task Inventory. These sections also allow you to comment on those tasks that you find are the most difficult for you to perform.

PROJECT OFFICER INSTRUCTIONS

1. General. The Military Police School is currently involved in redesigning basic military police training to produce military policemen better equipped to perform when they reach the unit. The emphasis is toward training replacements in tasks actually being performed in the field. The questionnaires in this packet are designed to identify those tasks.

The care with which you, the project officer, administer the questionnaires will determine the accuracy of field feedback and, consequently, the success or failure of this project.

2. Survey Packet Contents.

a. Questionnaire

b. Supervisor Questionnaire

c. Project Officer Instructions

d. Answer Sheets for Questionnaire

e. Pencils for use on answer sheets.

3. Responsibilities.

a. Unit Commander. The unit commander is requested to appoint a project officer and to monitor administration of the survey.

b. Project Officer. The project officer is responsible for the control and handling of questionnaires, for the administration of the questionnaires, and for returning completed and unused questionnaires to the Military Police School.

c. Questionnaire Administrator. The project officer may appoint someone to administer the questionnaire, if necessary. Normally, however, it is recommended that the project officer administer the questionnaire himself.

4. About the Questionnaires.

a. Questionnaire. This questionnaire is designed to identify tasks being performed by military policemen in the field and the frequency with which each task is performed.

b. Supervisor Questionnaire. The supervisor questionnaire is programmed to provide feedback on task criticality, probability of deficient performance, tnd the frequency with which each task is performed.

5. Who Takes The Questionnaire. The project officer is responsible for selecting individuals to take the questionnaires (respondents) within their units. Those selected must meet the requirements listed below:

a. The questionnaire respondent must:

(1) Be in an M.P. duty assignment (actually performing M.P duties)

(2) Have been on the job at least 90 days

b. The respondent to the Supervisor Questionnaire must:

(1) Command or supervise M.P. personnel

(2) Have been in a command or supervisory position in the unit for 90 days. (Assign questionnaires proportionately among officers and NCO's.)

6. Questionnaire Administration.

a. Questionnaire. The questionnaire will be administered in a controlled environment. Persons participating in the survey will be allowed two hours to complete the questionnaire and will turn the questionnaire and answers sheets in to the questionnaire administrator prior to leaving the survey area. Individual questionnaires and their accompanying answer sheets will be kept together.

See attached item for the procedure to be followed in administering the questionnaire.

b. Supervisor Questionnaire. Supervisors selected as respondents for this questionnaire will be allowed to sign for the questionnaire and take it with them. They will complete the questionnaire and return it to the project officer within a time frame he specifies. This time frame must be compatible with the suspense date to the Military Police School.

7. Questionnaire Handling. Questionnaires and answer sheets become FOR OFFICIAL USE ONLY when completed. For ease of accounting, each questionnaire and its accompanying answer sheets are numbered. All questionnaires must be returned to the Military Police School whether they are used or not. Instructions for returning the questionnaires to the Military Police School are contained in the basic letter. If you have any problems or questions, contact (NOTE: Give name or names, address, and telephone number).

ADMINISTERING THE QUESTIONNAIRE

A-1. Preparation. A classroom or training room equipped with desks will provide the most ideal site for administering the questionnaire. Questionnaires, answer sheets, and two electrographic pencils should be issued to participants after everyone who is to take the questionnaire has arrived. This ensures that everyone starts together.

A-2. Instructions. The questionnaire administrator will present the following instructions.

a. "Is there anyone here who is not working in an M.P. duty position? Is there anyone here who has not been assigned to their present duties at least 90 days? If so, please leave at this time."

b. "Will everyone at this time please read the first page in the questionnaire which has been issued to you."

(Note to the administrator: It must be emphasized that your enthusiasm for this project or lack of it will be contagious. It is important that you demonstrate a positive attitude to the participants. Allow time for the first page to be read and underline the importance of the questionnaire with the following statement.)

"I would like to stress the importance of this questionnaire. The Military Police School wants to design training to fit the job in the field. You are the only people who can tell them what they need to know. Please think through each question and give your best answers."

c. "Turn to Part I, Biographical Information, and answer questions 1-13. When you have finished, lay your pencil on the desk so I will know when to proceed to the next step."

d. "Now read the instructions found in Part II."

(Note to the administrator: Allow reasonable time for everyone to finish before moving to the next step.)

"Are there any questions?"

e. "As you read in the instructions, there are nine answer sheets accompanying your questionnaire. Take the answer sheets and number them one through nine to correspond to the first nine sections in Part III of the questionnaire. If you do not have nine answer sheets, raise your hand--I have extra ones. Use a separate answer sheet for each section. Answer only the number of questions listed in each and move to the next section and answer sheet. It is not necessary to write your name, rank, the date, or course at the top of the answer sheet. Also, disregard the blocks marked score, grade, extra points, and social security number."

f. "Because of the size of this survey, these answer sheets will be read by machine. You must use the special pencils provided so that the machine can read the answers. When marking your answer, take care to fill the vertical rectangle outlining the letter as shown by the example on page 4 of the instructions. Also, please be sure not to make any stray marks on the answer sheets. Finally, do not fold the answer sheets."

g. "All answers must be based on your experience in this your present unit. Do not call on experience in previous units. This means that if you do not perform a particular task in your present unit, you must mark do not perform this task on your answer sheet."

h. "You may begin answering part III. Remember Section ten, the written section. When you finish answering all questions, insert your answer sheets into the questionnaire and turn them in to me. You may leave when you are finished. Are there any questions?"

A-3. Conclusion. After everyone has taken the questionnaire, ensure that all questionnaires and answer sheets are accounted for. Collect the pencils provided so that they may be returned to the Military Police School along with the questionnaires and answer sheets.

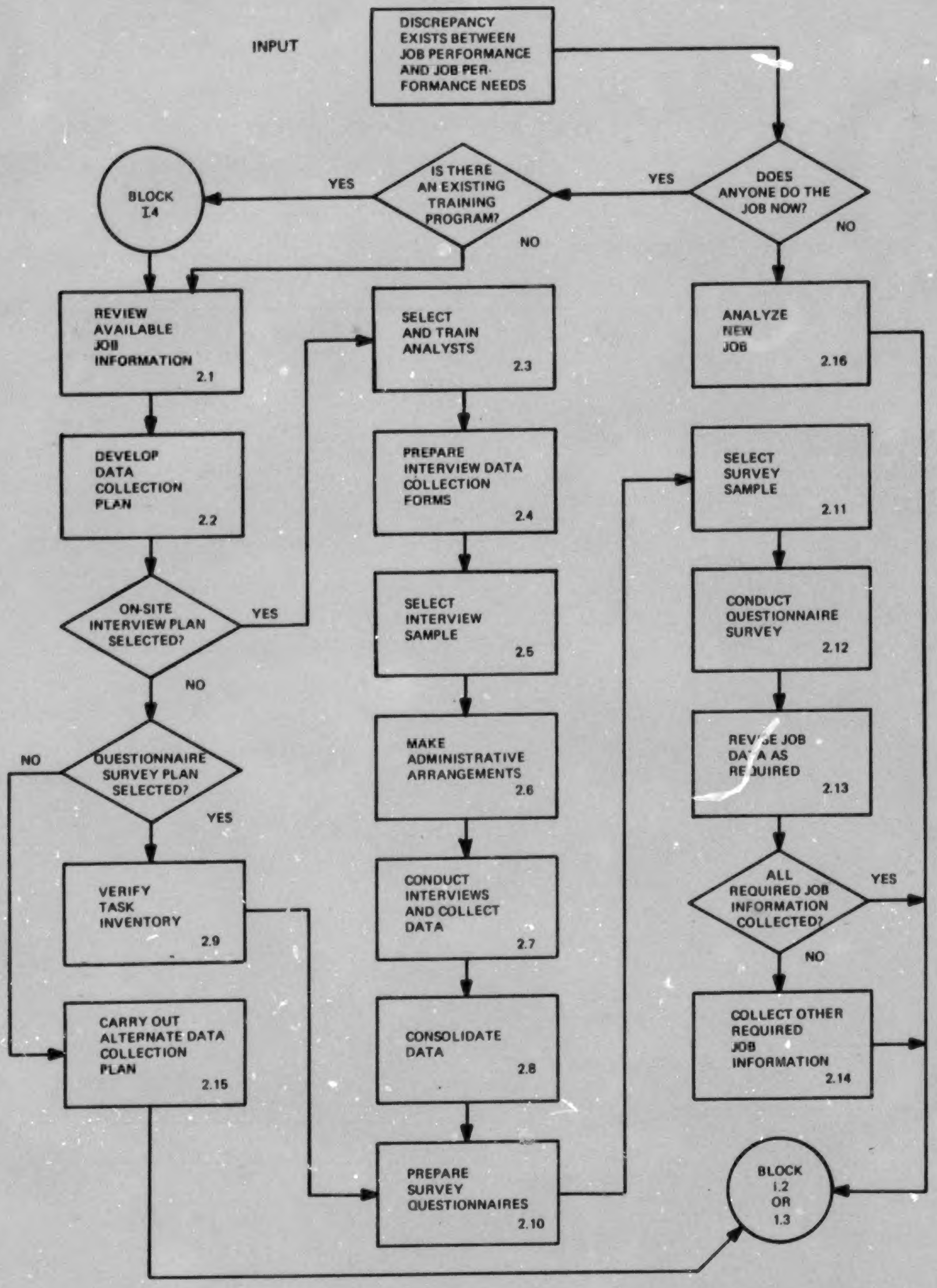
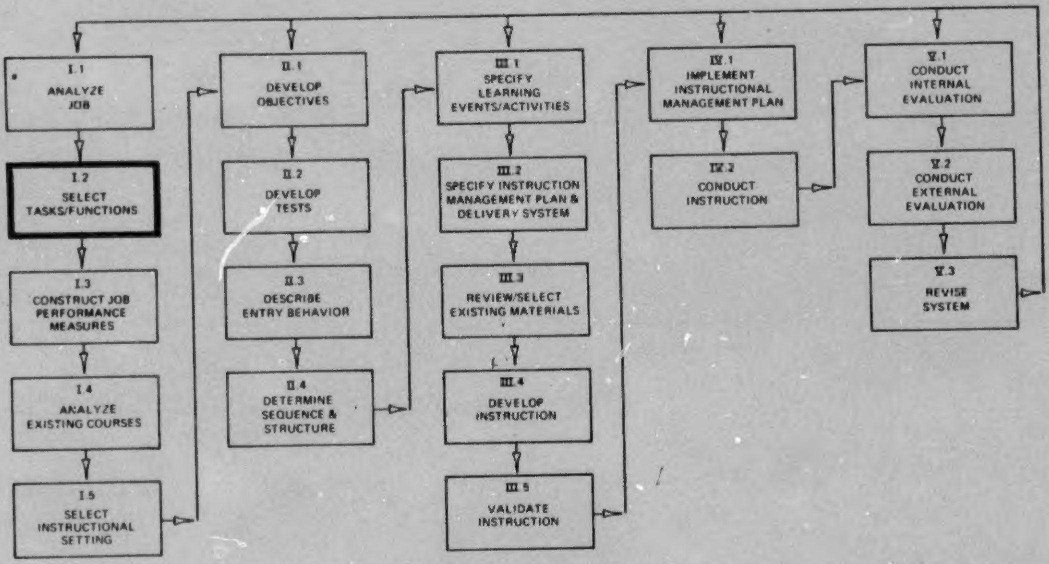

INPUT
DISCREPANCY EXISTS BETWEEN JOB PERFORMANCE AND JOB PERFORMANCE NEEDS
DOES ANYONE DO THE JOB NOW?
YES
NO
IS THERE AN EXISTING TRAINING PROGRAM?
YES
NO
BLOCK I.4
REVIEW AVAILABLE JOB INFORMATION 2.1
DEVELOP DATA COLLECTION PLAN 2.2
ON-SITE INTERVIEW PLAN SELECTED?
YES
NO
QUESTIONNAIRE SURVEY PLAN SELECTED?
NO
YES
VERIFY TASK INVENTORY 2.9
CARRY OUT ALTERNATE DATA COLLECTION PLAN 2.15
SELECT AND TRAIN ANALYSTS 2.3
PREPARE INTERVIEW DATA COLLECTION FORMS 2.4
SELECT INTERVIEW SAMPLE 2.5
MAKE ADMINISTRATIVE ARRANGEMENTS 2.6
CONDUCT INTERVIEWS AND COLLECT DATA 2.7
CONSOLIDATE DATA 2.8
PREPARE SURVEY QUESTIONNAIRES 2.10
ANALYZE NEW JOB 2.16
SELECT SURVEY SAMPLE 2.11
CONDUCT QUESTIONNAIRE SURVEY 2.12
REVISE JOB DATA AS REQUIRED 2.13
ALL REQUIRED JOB INFORMATION COLLECTED?
YES
NO
COLLECT OTHER REQUIRED JOB INFORMATION 2.14
BLOCK I.2 OR I.3

FIGURE I.5: Flowchart of Block I.1: ANALYZE JOB

BLOCK I.2: SELECT TASKS/FUNCTIONS


I.1 ANALYZE JOB
I.2 SELECT TASKS/FUNCTIONS
I.3 CONSTRUCT JOB PERFORMANCE MEASURES
I.4 ANALYZE EXISTING COURSES
I.5 SELECT INSTRUCTIONAL SETTING
II.1 DEVELOP OBJECTIVES
II.2 DEVELOP TESTS
II.3 DESCRIBE ENTRY BEHAVIOR
II.4 DETERMINE SEQUENCE & STRUCTURE
III.1 SPECIFY LEARNING EVENTS/ACTIVITIES
III.2 SPECIFY INSTRUCTION MANAGEMENT PLAN & DELIVERY SYSTEM
III.3 REVIEW/SELECT EXISTING MATERIALS
III.4 DEVELOP INSTRUCTION
III.5 VALIDATE INSTRUCTION
IV.1 IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN
IV.2 CONDUCT INSTRUCTION
V.1 CONDUCT INTERNAL EVALUATION
V.2 CONDUCT EXTERNAL EVALUATION
V.3 REVISE SYSTEM

OVERVIEW

Some tasks are seldom required on the job and only minimum job degradation would result if the tasks were not performed. On the other hand, some tasks are highly critical to successful job performance, and the complex nature of the task makes training essential. Economic and time considerations require a decision as to which tasks will be selected for training and which tasks will not. The purpose of this selection process is to make sure some form of instruction will be provided for all the important tasks and that instructional resources will not be wasted on unimportant tasks.

SELECT TASKS/FUNCTIONS

1.0 INTRODUCTION

As a result of the job analysis in Block I.1, all tasks have been identified for a particular job. A strong possibility exists that some of these tasks require no training since all or most job incumbents could easily perform the tasks without training. Some tasks are seldom required on the job and only minimum job degradation would result if the tasks were not performed. On the other hand, some tasks are highly critical to successful job performance, and the complex nature of the tasks makes training highly desirable.

Economic and time considerations require a decision as to which tasks will be selected for training and which tasks will not. The purpose of this selection process is to make sure some form of instruction will be provided for all the important tasks and that instructional resources will not be wasted on unimportant tasks.

"Training," as discussed in this block, is not necessarily resident school training. Formal training programs can take a number of forms such as correspondence study, training manuals, individualized learning packages, formal on-the-job training (FOJT) programs, group training, as well as installation support schools and resident schools. Also, Job Performance Aids (JPAs) may be developed that will eliminate or minimize training requirements for some tasks. In this block, we are using "training" in a general sense to include Job Performance Aids even though, technically, JPAs are a possible alternative to training rather than an actual method of training.

Here, you will not make a decision as to the method of training, how difficult training is, how long it should take, where it should take place, who should do it, or whether all or only part of those in the DOS should be trained. You will use the criteria approved by your command to select those tasks that will require training and to set aside those tasks for which training will not be provided. Many of the decisions listed above that you will not make in this block will be made in Block I.5: SELECT TRAINING SETTING. In this block, you will collect and consolidate a considerable amount of data that will be critical not only to making the selection decisions in this block, but also to making the training setting decisions in Block I.5.

There are good reasons why every task should not be included in the training program. The consolidated task list prepared by the job analysis team detailed the full dimensions of the job to include all of its variations caused by the mission and by geographical, procedural, and environmental conditions. It would be wasteful, in terms of time, personnel, money, and other resources, to provide the kind and amount of instruction required to equip each graduate to perform every task of a particular Defence Occupational Specialty (DOS) in any position in the world. For the same reason, it is often impractical to initially train personnel to the ultimate level of proficiency required at some future assignment. A situation might exist where two or more similar tasks are considered essential to adequate job performance. However, it may be that if a person is trained to do one of the tasks, he will then be able to perform the other similar tasks. In this case, it would be wasteful of training resources to include all of the similar tasks in the training program. These are just a few examples of why all tasks are not trained. Others will be mentioned later in this block.

The selection of tasks for training is a judgmental procedure that requires:

1. a clear understanding of the duties, tasks, and elements that make up the job,
2. analysis of collected data that represents the judgments of a relatively large number of individuals who are familiar with the job, and
3. an understanding of the resources and responsibilities of the Command making the training choices.

As you work through the following section, keep in mind that you are not trying to match or remember the tasks that "have always been trained in school" but you are trying to decide which of the tasks on the list are of enough importance to justify training at all. It is critical that you decide which tasks are necessary to the mission and that you make this decision in a systematic way, using, whenever possible, the advice and judgment of people who have done the job in the real world setting.

One of the facts of life for those involved in ISD is that funds and resources usually are not available for accomplishing all that you think should be done. This may be the case in selecting tasks for training. Some tasks that you think should be trained may not be selected for training simply because sufficient resources are not available to train them. However, the fact that resources are not available this year does not mean they will not be available next year. For these reasons, in this block you first select from the list of tasks that make up the job those tasks that your data indicate should be trained if training resources were not a constraint. Then, with inputs and assistance from management, determine which of the tasks will be trained in view of existing constraints of money, time, personnel, and equipment.

The outputs of this block will include:

1. a list of tasks that your data indicate should be trained if no resource constraints existed,
2. a list of tasks selected for training, and
3. the data upon which the above decisions were based and upon which additional decisions can be based in Block I.5.

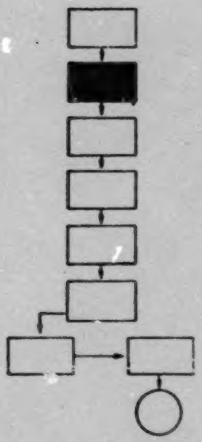
The steps in selecting tasks for training are shown in Figure I.12 (the fold-out page at the end of this block).

2.0 PROCEDURES

You arrived at this point in the ISD process by one of two routes. The first possible route was that you analyzed the job in Block I.1 and prepared a list of duties, tasks, and elements that make up the job. The other possible route was from Block I.4: ANALYZE EXISTING COURSES. Perhaps in analyzing the existing courses, you found the original job analysis adequate for your needs, but you found the procedures and criteria used to select tasks for training not adequate. This means you had to return to this block to select tasks for training based on criteria that meet the needs of your command.

In either case, you have a consolidated list of duties, tasks, and elements; and that is the starting place for this block.

2.1 Select Evaluation Criteria



Before providing you with information as to how to select evaluation criteria, the major selection criteria will be described in some detail. The primary thing to remember at this point is that to systematically select tasks for training, there must be a basis for selections. You need some important facts about the tasks in order to make the selection decisions. Most likely you would not choose to train a task that was not critical to the mission, was not difficult to learn, that almost everyone could do with ease, that was performed by only a small percentage of job incumbents, and was rarely performed at all. However, you would have no way of knowing these facts about the task if you had not selected meaningful criteria, and then obtained responses from job incumbents and others as to what degree each task met your selected criteria.

2.1.1 Criteria for Selecting Tasks for Training

The following criteria are bases for selection of tasks for training. The list is not intended to be all inclusive; your tasks and the needs of your command may require different or additional criteria. However, the following cover most situations and will at least give you a good starting point.

2.1.1.1 Percent Performing

The criterion of percentage of job incumbents who perform the task points to the need for training tasks that are most often performed on the job.

EXAMPLE

> One task for a weather technician is "answer telephone inquiries about the weather." If you found that 96 percent of all weather technicians performed this task, the implications for training would be different than if you found that only 10 percent performed it.

In the above example, if only 10 percent of job incumbents perform a task, there is a strong probability that 90 percent of your training resources would be wasted if you trained all weather technicians to perform the task.

To obtain data for determining the percentage of job incumbents performing each task, simply ask on the questionnaire, "Do you perform this task?" Or calculate the percentage performing from answers to other related questions. If, for example, in collecting "frequency of task performance" data (this criterion will be discussed further in Section 2.1.1.5), one of the possible responses is "never" or "do not perform," you will have the basic data for determining the percent performing.

2.1.1.2 Percent of Time Spent Performing

The percentage of time spent performing a task is a criterion that points to a need for providing training to assist job incumbents in efficient performance of those tasks on which they spend the most time. Selection of tasks for training based on this criterion offers chances for high pay-off in terms of return on training dollars expended.

EXAMPLE

> In the Protective Equipment/Pressure Suit DOS, 6.67 percent of average time of all members is spent performing the task of "maintain rigid survival kits." Only 0.16 percent of average time is spent on the task of "install microphones in oxygen masks." If more effective training could increase productivity 50 percent in the first task, 3.33 percent of the total time of all members might be saved. This would be a significant savings. However, if productivity were increased 50 percent for the second task, only 0.08 percent of the total time would be saved. This represents a much smaller savings opportunity.

To obtain data for determining the percentage of time spent performing the tasks in a DOS, inputs are required from a large number of job incumbents. Usually they are not asked to state the percentage of their time spent on each task because such a question would be very difficult to answer. Instead, they are usually asked to rate each task as to the amount of time spent performing it as compared to their other tasks.

EXAMPLE

> You are to rate the relative amount of time you spend performing each task in your present job. Relative time spent means the total time you spend doing the task compared with the time you spend on each of the other tasks in your present job.
>
> Use a rating of "1" if you spend a "very much below average" amount of time on a task.

Use a rating of "2" for "below average time."

Use a rating of "3" for "slightly below average time."

Use a rating of "4" for "about average time."

Use a rating of "5" for "slightly above average time."

Use a rating of "6" for "above average time."

Use a rating of "7" for "very much above average time."

From the above information, a computer program such as that used by the Air Force with their Comprehensive Occupational Data Analysis Program (CODAP) can compute and print out the average percent of time spent by members of the DOS who perform the task, and the average percent of time spent by all members of the DOS. For further information on how this precent of time spent is derived, see Appendix A of this block.

2.1.1.3 Probable Consequences of Inadequate Performance

The criterion of probable consequences of inadequate performance points to the need for selecting tasks for training that are essential to job performance, when needed, even though the tasks may not be performed frequently. The consequences of inadequate performance on certain tasks could result in injury to personnel, loss of life, or damage to equipment. Inadequate performance could have a serious impact on the mission, the operation, the product, the equipment, or the operator.

EXAMPLES

1. More and more electronic equipment is being transistorized and is therefore less subject to malfunction. This fact should reduce the amount of maintenance training that an operator requires. However, there may be a number of malfunctions that, although occurring very infrequently, would be extremely critical if immediate corrective action were not taken by the operator. Severe damage to the equipment, materials, or products might result. Under such circumstances, the criticality of the infrequently used tasks is so great that it must be considered in choosing tasks for training.
2. The probable consequences of inadequate performance of such combat tasks as "identify enemy aircraft" could be loss of life and equipment.
3. The probable consequence of inadequate performance of the task of "write trip report" is negligible. If this task were selected for training, it would be on the basis of factors other than probable consequences of inadequate performance.

To obtain data on this criterion, individuals who are familiar with the job are asked to rate probable consequences of inadequate performance of each task according to all or a subset of such categories as those listed below.

1. Negligible
2. Trivial
3. Rather trivial
4. Not very serious
5. Fairly serious
6. Serious
7. Very serious
8. Extremely serious
9. Disastrous

2.1.1.4 Task Delay Tolerance

The delay tolerance of a task is a measure of how much delay can be tolerated between the time the need for task performance becomes evident and the time actual performance must begin. There are some tasks encountered by job incumbents as part of their normal job in which no delay can ever be tolerated between the time the need for task performance becomes evident and the time the actual performance must begin. The job incumbent who encounters the task must be capable of doing it, then and there, without taking time to read how to do the task, or find someone to advise him or take over completely. For other tasks, a delay of a few minutes or perhaps half an hour might be quite acceptable, or even mandatory, while the job incumbent gets advice, checks technical orders, regulations, etc. And for some tasks, there might be time to assemble a group of experts to confer before proceeding.

The delay tolerance of a task is a measure of how much delay can be tolerated between the time the need for task performance becomes evident and the time the actual performance begins. The following are examples of low delay tolerance tasks requiring immediate performance:

EXAMPLES

1. Use artificial respiration to restore the breathing of an accident victim.
2. Pull ripcord of emergency parachute if main parachute fails.
3. Warn suspect of his legal rights before questioning.
4. Film historic occasion for official records.
5. Extinguish fire in aircraft engine during startup on flight line.

Tasks determined to have a low delay tolerance should be given relatively high priority for selection for training.

Examples of tasks having a higher delay tolerance, thereby permitting performance delay, would include:

EXAMPLES

1. Review books for unit library.
2. Refill fire extinguisher after use.
3. Advise major command of unit manning problem.
4. Fit microphones in aircrew oxygen masks.

A high delay tolerance does not exclude a task from training, but indicates that other factors will be more of a basis for acceptance or rejection.

To obtain data on this criterion, individuals who are familiar with the job are asked to rate the amount of delay that can be tolerated before task performance begins, according to all or a subset of such categories as those listed below.

1. Extremely high: There is very little requirement for immediate performance
2. Very high
3. High
4. Rather high
5. Average
6. Rather low
7. Low

8. Very low
9. Extremely low: Task must be performed immediately whenever it is encountered

2.1.1.5 Frequency of Performance

While the probable consequences of inadequate performance of a particular task are serious and the task delay tolerance is low, the task might still rate low for training priority if it is rarely performed.

EXAMPLE

> For a medical corpsman, the task of "deliver baby" is so rarely performed that it probably would not be trained in spite of the serious consequences of inadequate performance and the relatively low task delay tolerance.

On the other hand, if a task is performed frequently, the pay-off in terms of return on training dollars expended is likely to be great, particularly if there is a known "best way" to perform the task.

A practical way to collect frequency of performance data on tasks is to rate their frequency of performance on a scale such as the following:

1. Never perform
2. Less than once per month
3. At least monthly, but less than twice per week
4. Twice per week or more

2.1.1.6 Task Learning Difficulty

The learning difficulty of a task refers to the time, effort, and assistance required to achieve performance proficiency. Some tasks encountered in each DOS are so easy or so familiar that they can be readily "picked up" on the job without formal training. At the other extreme, some tasks are so complicated that a job incumbent can perform them adequately only after lengthy, formal training. Other tasks lie somewhere between these extremes and require different levels of training. Tasks easy enough to be "picked up" on the job without training might be:

EXAMPLES

1. Sweep floors.
2. Collect food trays from patients in hospital wards.
3. Distribute unclassified correspondence in an office.

Tasks requiring lengthy, formal training might be:

EXAMPLES

1. Diagnose malfunction in an airborne radar weapons system.
2. Defuse unexploded enemy bombs.
3. Identify parasites in clinical specimens.

To obtain data on the criterion of task learning difficulty, job incumbents or others might be asked to rate tasks they perform as to the training time required to achieve proficiency, or as to the difficulty of "picking up" the task on the job without formal training. The following rating scale might be used.

1. Extremely low: No training is required
2. Very low
3. Low
4. Below average
5. Average
6. Above average
7. High
8. Very high
9. Extremely high: Training is essential

2.1.1.7 Probability of Deficient Performance

The criterion of probability of deficient performance is used to insure that training is given in those essential job skills in which job incumbents frequently perform poorly. In any job, there are tasks that are more difficult to accomplish (or easier to bungle) than others. By tabulating the judgments of knowledgeable personnel regarding the probability of deficient performance, a list of these poorly performed tasks can be produced. Training of these tasks, regardless of their criticality, must be given serious consideration.

EXAMPLES

1. If equipment downtime is often caused by faulty soldering, this skill may require additional emphasis in a list of tasks selected for training of repairmen.
2. If widespread theft of items guarded by military police is a problem, the tasks of "guard packages, materials, and property" and "prepare physical security plans" may require additional emphasis.

To obtain data on the criterion of probability of deficient performance, supervisors of job incumbents might be asked to rate each task as to how often, according to the scale below, subordinates in the DOS perform the task in an unacceptable manner:

1. Rarely if ever
2. Less often than other tasks
3. About as often as other tasks
4. More often than other tasks
5. Very often

2.1.1.8 Time Between Job Entry and Task Performance

The criterion of the time interval between completion of training and performance of the task on the job has some significance in selecting tasks for training. Here, the determining factors are:

1. Whether or not there is a high probability of the graduate encountering the task on the job fairly soon after completing training. "Fairly soon" means, in this context, that tasks encountered within the first year after training

would, everything else being equal, be weighed more heavily for selection than those not encountered until one to two years later.

2. The predicted or measured amount of decay of the skill that will take place during the time interval.

While this criterion is one of the possible bases for selecting tasks for training, it also is excellent data for use in Block I.5: SELECT INSTRUCTIONAL SETTING. In Block I.5 you will decide when training will take place and who will be trained; i.e., whether all those in the DOS or only the individuals judged likely to perform the task will be trained. In Block I.2, however, if you are forced to choose between two tasks that are otherwise equally desirable, you should choose the one most likely to be required before ability to perform the task had decayed from disuse.

EXAMPLE

> The ability to send and receive Morse Code is a relatively difficult skill to acquire. If the skill is not used, a considerable amount of decay is certain to occur. If the skill is only rarely needed by personnel, it may be wise not to include the task in the training given to all trainees. However, if the skill is likely to be used immediately after graduation by most graduates, it probably should be included in the training for all trainees.

To obtain data on this criterion job incumbents and others might be asked to rate the time between job entry and task performance on a scale such as the following:

1. Task not yet performed.
2. Task first performed more than 4 years after assignment.
3. Task first performed between 2 and 4 years after assignment.
4. Task first performed between 1 and 2 years after assignment.
5. Task first performed between 6 months and 1 year after assignment.
6. Task first performed between 3 months and 6 months after assignment.
7. Task performed during first 3 months of assignment.

2.1.2 Choosing Appropriate Criteria

Now that you have a clearer idea of the criteria you can use in judging which tasks to choose for training, you are ready to choose the criteria for your specific list of tasks. Remember, you may not wish to use all the criteria listed, and you may wish to include criteria that are not listed. Some of the factors that will influence your choice of criteria are:

1. Whether you are likely to have sufficient resources to train all or most of the tasks you think should be trained.

EXAMPLE

> If you have sufficient resources to train all or most of the tasks, your primary concern will be to delete any tasks that clearly do not require training, and to provide as much useful data as practical for making the instructional setting decisions in Block I.5. You probably will concentrate on collecting data on percent performing, time between job entry and task performance, and task learning difficulty.

2. From how many people you intend collecting data.

EXAMPLE

If you intend surveying 3,000 people for most of your data, you may wish to collect data on some of the other criteria from a different, smaller group; for example, perhaps 20-30 experts in that DOS.

3. From what types of people you intend collecting data.

EXAMPLE

You probably will not ask job incumbents the same questions you ask their supervisors. For instance, data on the criterion of probability of deficient performance would be collected from supervisors but probably not from job incumbents.

4. The nature of the tasks that make up the job.

EXAMPLE

For tasks such as combat tasks, the criterion of probable consequences of inadequate performance is of special importance. However, for routine clerical tasks, this criterion is not appropriate.

5. Information already available.

EXAMPLE

The criterion of time between job entry and task performance, for example, would not be used if existing doctrine required certain tasks or duties be performed only after the job incumbent has been assigned for a set period of time.

6. Number of tasks that make up the job; i.e., number of criteria you can use without making completion of the questionnaire too time consuming.

EXAMPLE

> If the task list is lengthy, limit selection to three or four criteria that you consider essential. As a general rule, those included in the survey should be able to complete your questionnaire in approximately 2 hours or less. If it takes much longer than this, you probably are imposing too much tedious work on those from whom you are asking assistance. More valid data might be gathered by using any additional criteria on a smaller number, perhaps 20-30, of other people familiar with the job.

You do not have to use the same criteria for all the tasks on a questionnaire.

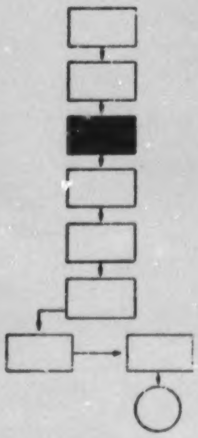
EXAMPLE

> If the DOS included both combat and non-combat tasks, you might collect different data for different tasks. For the combat tasks, you might ask for data on probable consequences of inadequate performance. For the non-combat tasks, you might prefer to ask about task learning difficulty or time between job entry and task performance. Also, you might collect data on time spent performing the non-combat tasks; however, this would be less appropriate for combat tasks.

If you use different criteria for different tasks limit the groups of criteria to two or, at the most, three. If you list different criteria for each task, you will impose on those who will provide you with data. Also, you will create a tremendous amount of work for yourself both in preparing the survey forms and in organizing and interpreting the collected data.

As was mentioned earlier, one of the outputs of this block is data upon which additional decisions can be made in Block I.5. For this reason familiarize yourself with that block before you decide the criteria on which to collect data. To avoid conducting another questionnaire survey in Block I.5, collect all data here that can more economically be collected at this point.

2.2 Select Sources for Survey

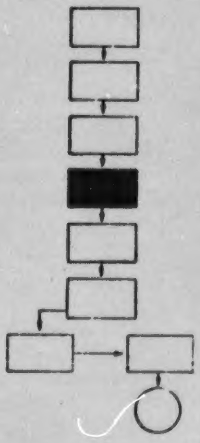


Now that you have decided on the criteria to use to select tasks for training, determine where you will get data that rates each of your tasks for each criterion. First, decide what categories of personnel you wish to survey. If the job with which you are concerned is an existing job, definitely include job incumbents, and probably supervisors. In some cases, you may need to survey only recent job incumbents or only experienced job incumbents. For a new job you may wish to survey groups who do a similar job, subject matter experts (SMEs), and instructors.

Once you decide on the categories of personnel to be included in your survey, determine your sample size and choose specific units for survey. Have a fairly large number of job incumbents, since, as a general rule, the larger the number of individuals who participate in the selection process, the more reliable the data. Details of selecting survey samples were given in Section 2.11, page 71 of Block I.1.

It was suggested in Block I.1 that you would collect most of the data required to make the selection decision in this block at the same time and with the same questionnaire with which you validated your task list for Block I.1. In that case, your survey sources would, of course, be basically the same. Section 2.1 of this block mentioned that, for several criteria, you might want additional data from perhaps 20-30 additional individuals. If so, have personnel records checked to locate individuals who have the particular characteristics you want for these additional inputs.

2.3 Prepare Data Collection Forms



To obtain data that rates each of your tasks for each criterion, prepare an appropriate rating scale for each criterion. Examples of possible scales were listed in Sections 2.1.1.1 - 2.1.1.8 of this block. Also, sample questionnaires are shown in Appendices C and D, pages 100 and 103 of Block I.1.

Notice that in the scales referenced above, the higher numbers indicate a greater need for training.

EXAMPLES

1. In Section 2.1.1.2, page 119, "1" represents very much below average time spent on a task; "7" represents very much above average time.
2. In Section 2.1.1.3, page 121, "1" represents negligible probable consequences of inadequate performance; "9" represents disastrous consequences.

Maintain this numbering system in each of your data collection forms to simplify the decision making process once the data are gathered.

In most cases, the questionnaire you prepare for the job incumbents' supervisors will be different from the ones prepared for job incumbents, even when the same evaluation criteria have been selected. However, usually only slight changes in wording are required.

EXAMPLE

> To obtain "percent performing" data, ask the job incumbents, "Do you perform this task?" Ask their supervisors, "Do those whom you supervise, in this DOS, perform this task?"

In addition to the form used to collect task selection data, you will need a form for gathering the same kinds of background information discussed in Section 2.4, page 49, of Block I.1. An example of such a form is shown in Figure I.7, page 50 of Block I.1.

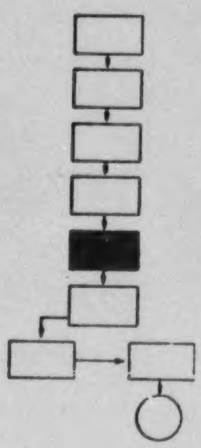
Collecting this background information serves several important purposes.

1. Such information permits you to check back with any of the individuals to verify or get additional data.
2. Such information permits you to validate your data if, for any reason, the data is suspect.
3. Knowing that the accuracy of the information provided can be checked, tends to impress on the individuals being surveyed that this is a serious and important undertaking.

4. Other important management information can be obtained with the background information form. This was discussed in Section 2.4 of Block I.1.

In addition to these data collection forms, you must prepare instructions for using, and instructions for administering the questionnaires. Examples of instructions appear in Appendix E, page 106 of Block I.1.

2.4 Collect and Consolidate Data



Now that you have selected the sources for your survey and have prepared the forms and the instructions for their supervision and use, conduct the survey. Refer to Section 2.12, page 72 of Block I.1 for details of carrying out this effort.

When you have collected the data, you are ready to consolidate it into a usable form. You probably made decisions in Section 2.3: Prepare Data Collection Forms, as to the general form that your consolidated data will take. Whether your collected data is processed by hand or by machine, you must determine the form of the end product. Examples of how you might consolidate the data are given here.

EXAMPLES

1. Assume you sent questionnaires to units in CONUS, to units in Asia, and to units in Europe. You used four different criteria for making judgments as to which tasks to choose for training; in this example, we will call these criteria A, B, C, and D. In each of the three geographical locations, you surveyed both job incumbents and their supervisors. However, you used only criterion A, B, and C with the job incumbents, and criterion B, C, and D with the supervisors. You might consolidate your data as follows:

   a. Using the form shown in Figure I.13, list all the tasks in the left-hand column under TASKS.

   b. Calculate the mean (average) response from all job incumbents for criterion A for the first task. Enter this number in the appropriate block in the form. (The number 1.04 has been entered in the correct spot on the sample form.)

   c. Calculate the mean responses from all job incumbents for criterion A for each of the remaining tasks. Enter these numbers in the appropriate columns. (Arbitrary numbers have been entered in the first column on the form. If we assume that each criterion was rated on a four-point scale--there were four possible responses--then 1.00 would be the lowest possible rating and 4.00 the highest.)

   d. Calculate the mean responses from all job incumbents for criterion B and criterion C for each task. Enter these numbers in the correct columns.

   e. Repeat the above for all supervisors for criterion B, criterion C, and criterion D for each task. Enter the data in the correct columns.

If you had reason to believe the information from Asia or Europe might be significantly different from that obtained from CONUS, and if such a difference would be important to you, you would handle the data somewhat differently. The data consolidation form would have six "responses from" columns instead of the two shown on our sample form.

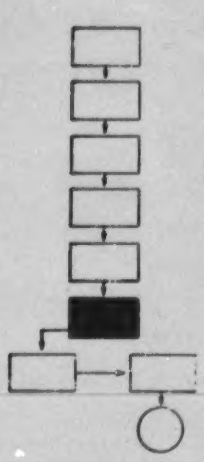
TASK	RESPONSES FROM JOB INCUMBENTS			RESPONSES FROM SUPERVISORS		
	Criterion (A)	Criterion (B)	Criterion (C)	Criterion (B)	Criterion (C)	Criterion (D)
(Task 1)	(1.04)					
(Task 2)	(3.16)					
(Task 3)	(2.45)					
(Task 4)	(3.02)					
(Task 5)	(3.72)					
(Task 6)	(2.89)					
(Task 7)	(1.41)					
(Task 8)	(3.11)					
(Task 9)	(2.01)					
(Task 10)	(2.41)					
(Task 11)	(2.39)					
(Task 12)	(2.97)					

FIGURE I.13: Sample Data Consolidation Form

2. Another way to consolidate certain types of data is by computer printout such as that shown in Figure I.14. This is a Comprehensive Occupational Data Analysis Program (CODAP) printout for a weather technician. The first column of numbers gives the percent of members performing (see Section 2.1.1.1). The second column of numbers gives the percent of time spent performing (see Section 2.1.1.2). The other columns are self-explanatory. Exactly how these numbers, particularly those in the second column, were computed is described in Appendix A of this block.

Data collected in surveys such as the one discussed in this block can be consolidated in a number of different ways. The approaches outlined here are only two possible approaches. Make sure you have good reasons for your choice of data consolidation techniques, and keep in mind that the purpose of data consolidation is to help you choose tasks for training.

2.5 Delete Tasks That Do Not Require Training



Once your data is collected and consolidated into a usable form, you are ready to begin making selection decisions. The first step is to select tasks that would be trained if there were no resource constraints. Do this by deleting those tasks that do not require training.

While all task selection decisions are a matter of judgement, they can be made confidently if you have collected and organized meaningful data.

```
                   CUMULATIVE SUM OF AVG % TIME SPENT BY ALL MEMBERS.......
                   AVERAGE PERCENT TIME SPENT BY ALL MEMBERS.......       .
                   AVG % TIME SPENT BY MEMBERS PERFORMING..        .       .
                   PERCENT OF MEMBERS PERFORMING...        .       .       .
                                                   .       .       .       .
      DUTY/TASK TITLE                              .       .       .       .

ANSWER TELEPHONE INQUIRIES ABOUT THE WEATHER     96.54    1.78    1.72    1.72
MAINTAIN METEOROLOGICAL WATCH                    92.22    1.58    1.46    3.18
INTEGRATE ANALYSIS, OBSERVATIONS & FORECASTS     92.00    1.49    1.38    4.56
INTERPRET CENTRALLY PREPARED PRODUCTS FOR   .    90.78    1.41    1.28    5.84
 TERMINAL AND ROUTE FORECASTS
PROVIDE ONROUTE DESTINATION & ALT. FORECASYS     88.18    1.43    1.26    7.11
PERFORM SHORT PERIOD FORECASTING OF FOG,         91.64    1.37    1.25    8.36
 STRATUS, AND VISIBILITY
PERFORM SHORT PERIOD FORECASTING OF SURFACE      92.51    1.35    1.25    9.61
 WINDS AND LOW LEVEL TURBULENCE
EVALUATE PILOT REPORTS                           91.93    1.34 .  1.23   10.84
CONDUCT PILOT WEATHER BRIEFINGS                  84.15    1.46    1.23   12.07
DISSEMINATE WEATHER WARNINGS                     91.35    1.32 .  1.21   13.28
COMPLETE AND SIGN WEATHER CLEARANCE FORMS        84.15    1.44    1.21   14.49
IDENTIFY AND EVALUATE AREAS OF SEVERE WEATHER    90.78    1.31    1.19   15.68
PERFORM SHORT PERIOD FORECASTING OF CONDEN-      89.34    1.25    1.12   16.79
 SATION, PRECIPITATION, & ICING
INDICATE POSITIONS OF FRONTS & PRESSURE          91.07    1.20    1.10   17.89
 SYSTEMS ON CHARTS
PERFORM SURFACE CHART ANALYSIS                   91.35    1.19    1.09   18.48
DETERMINE FRONTAL-ASSOCIATED WEATHER             88.76    1.21    1.07   20.06
PREPARE THUNDERSTORN & HAIL WARNINGS             88.18    1.21    1.07   21.13
EVALUATE EFFECTS OF SURFACE CONVEC. HEATING      88.18    1.19    1.05   22.18
PREPARE AND PRESENT OPERATIONAL OR PLANNING      77.52    1.34    1.04   23.22
 WEATHER BRIEFINGS
PREPARE SURFACE WIND WARNINGS AND ADVISORIES     88.76    1.15    1.02   24.24
DETERMINE SOLUTIONS TO OPERATIONAL METEORO-      67.44    1.51    1.02   25.26
 LOGICAL PROBLEMS
ANALYZE SOUNDING DATA ON THERMODYNAMIC DIAGRAMS  88.47    1.15    1.02   26.28
USE PROBABILITY TABLES IN FORECASTING            83.86    1.21    1.01   29.31
PREPARE WET WATCH ADVISORIES                     84.44    1.20    1.01   28.30
USE OBJECTIVE FORECAST STUDIES IN PREPARING      88.47    1.14    1.01   29.31
 WEATHER FORECASTS
COMPUTE STABILITY INDICES                        88.76    1.11    0.99   30.30
OREINT AIRCRAFT IN FLIGHT                        83.86    1.17    0.98   31.28
OPERATE REPRODUCTION EQUIPMENT                   77.23    1.26    0.97   32.26
PERFORM FRONTAL ANALYSIS                         67.61    1.10    0.96   33.22
INTEGRATE RADAR AND PILOT REPORTS ON SURFACE     68.47    1.02    0.95   34.17
 ANALYSIS
LOCATE AREAS OF MECHANICAL TURBULENCE            83.57    1.12    0.94   35.11

     {NEXT 32 TASKS OMITTED}

LOCATE HEIGHT OF TROPOPAUSE                      78.96    0.93    0.73   61.60
MAINTAIN QUALITY CONTROL PROGRAM                 62.82    1.16    0.73   62.34
ANALYZE THERMODYNAMIC DIAGRAMS                   70.89    1.02    0.73   63.06
MONITOR ANALYSIS OF METEOROLOGICAL CHARTS        63.98    1.11    0.71   63.77
 AND DIAGRAMS
DETERMINE WEATHER PHENOMENA ON THE BASIS OF      74.93    0.94    0.71   64.48
 VORTICITY CONCEPTS
DETERMINE ADVECTION TYPES AND EFFECT ON          74.64    0.93    0.71   65.19
 PRESSURE SYSTEMS
```

FIGURE I.14: Sample CODAP Printout

EXAMPLE

> If very few job incumbents perform a particular task, and the consequences of inadequate performance are negligible, and there is very little requirement for the task to be performed immediately without time to get assistance and advice, and the task is not at all difficult to learn, the task should not be trained.

If you consolidated and recorded your data as described earlier in this block, you may have a list that looks like Figure I.15. Of course, you would have included many, many more tasks, but those listed should serve as an adequate example.

First, look at Task 1. This could be the task discussed in the previous example. Notice that both job incumbents and supervisors are in general agreement as to how the task ranks as judged by the various criteria. Both incumbents and supervisors rate the task very low on all criteria; therefore, you should reject this task for training.

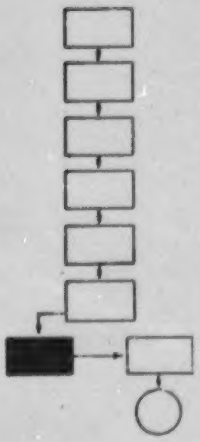
Now look at Task 4. Suppose that this task is "sweep floor," that most job incumbents perform the task but the consequences of inadequate performance are negligible, that there is little requirement for immediate performance, and that the task is very easy to learn. This task, in spite of the large number performing, should not be trained.

If you are in doubt as to whether or not a task should be trained, it is probably better at this point not to reject it; it probably will be filtered out in the next section. What you are attempting to do here is to delete the tasks that clearly would waste any training resources devoted to them.

TASK	RESPONSES FROM JOB INCUMBENTS			RESPONSES FROM SUPERVISORS		
	Criterion (A)	Criterion (B)	Criterion (C)	Criterion (B)	Criterion (C)	Criterion (D)
(Task 1)	(1.04)	(1.17)	(1.14)	(1.09)	(1.15)	(1.07)
(Task 2)	(3.16)	(3.28)	(3.71)	(3.01)	(3.36)	(3.60)
(Task 3)	(2.45)	(2.49)	(2.53)	(2.46)	(2.48)	(2.61)
(Task 4)	(3.02)	(1.23)	(1.17)	(1.12)	(1.23)	(1.03)
(Task 5)	(3.72)	(3.67)	(3.24)	(3.50)	(2.98)	(3.12)
(Task 6)	(2.89)	(3.12)	(3.19)	(3.06)	(3.14)	(2.99)
(Task 7)	(1.41)	(3.87)	(2.05)	(3.82)	(1.56)	(1.47)
(Task 8)	(3.11)	(1.33)	(1.64)	(2.07)	(1.91)	(1.21)
(Task 9)	(2.01)	(1.47)	(1.96)	(1.97)	(1.84)	(2.11)
(Task 10)	(2.41)	(2.39)	(2.52)	(2.40)	(2.40)	(2.70)
(Task 11)	(2.39)	(2.43)	(2.48)	(2.43)	(2.39)	(2.64)
(Task 12)	(2.97)	(3.04)	(3.43)	(3.01)	(3.15)	(3.11)

FIGURE I.15: Sample Consolidated Data Form

2.6 Select Tasks for Training



While analyzing data and selecting tasks for training are required steps in this block, another step, that of securing management inputs and approval, is so closely related that they cannot be completely separated. The major considerations in choosing tasks for training are costs, time, and other resources. However, you have not been asked to determine what resources are available or may be required. These are management concerns. Your responsibility is to work as part of a team--of which management personnel are an important part--to select tasks for which training will be provided.

Since, in the last section, you deleted some tasks that did not require training, what is left is a list of tasks that you think should be trained. At this point, you need some management inputs before proceeding. You may have noticed that the next section in this block is Secure Management Inputs and Approval. Actually it is impossible to talk about selecting tasks for training without also considering management inputs. Here, you need to be told by management approximately what resources are available for training this particular DOS in order to know approximately how many of the tasks can be trained.

If the management input indicates that all the tasks can be trained, your effort in this block is completed and you can move on to the next block. Unfortunately, this is not likely to happen. There probably will never be enough time and other resources to train everything that it might be desirable to train.

Suppose the management input indicates that 75 percent of the tasks you think should be trained can actually be trained. If so, proceed as follows:

1. Select the 60-65 percent of the tasks that your data indicates are most in need of training.
2. Select the 15-20 percent of the tasks that your data indicates are least in need of training.
3. Rank order the remaining tasks from the one you think most needs training to the one you think least needs training.
4. With the above lists and your rationale for ranking tasks as you did, get back with management and make the final selection decisions.

Suppose the consolidated data in Figure I.15 is representative of your data. Remember that you already have deleted Task 1 and Task 4. Also remember that the numbers represent the mean (average) response from each of the two groups on each criterion and that high numbers indicate more of a need for training.

First, select the 60-65 percent of the tasks that you think are most in need of training. The reason for not rank ordering these 60-65 percent is that management has already indicated that at least this many tasks will be trained. Rank ordering all tasks is a tedious, time-consuming effort and should be done only when necessary.

EXAMPLES

You will notice that for some of the tasks in Figure I.15, not only is there a high level of agreement in ratings of the criteria of each, but also the tasks are uniformly given high rankings. These tasks (2, 5, 6, and 12) should tentatively be selected for training.

For Task 9, there is a high level of agreement in ranking the task, and the task is uniformly given a low ranking. This task should tentatively be rejected.

For Task 8, the criterion A rating is high, but the other criteria are uniformly relatively low. If criterion A were Frequency of Performance and the other criteria were Task Delay Tolerance, Consequences of Inadequate Performance, and Task Learning Difficulty, you probably would tentatively reject this task also.

Task 7 shows yet a different situation. Incumbents and supervisors are in general agreement. However, both give the task a high rating under Criterion B and low ratings for all other criteria. Again, how you judge this task will depend on what your command considers important. If criterion B were Consequences of Inadequate Performance, you probably would select it for training.

At first look, Tasks 3, 10, and 11 might leave you undecided. There is a high level of agreement, but the ratings are neither high nor low. However, suppose Task 11 is a prerequisite to Task 12; that is, if one does not know how to do Task 11, he will not know how to do Task 12. For example, Task 12 might be "verify that enemy bomb has been defused," while Task 11 might be "defuse enemy bomb." By checking the elements that make up the two tasks, you find that, if a person did not know how to defuse a bomb, he would not be able to verify that one had been defused. On this basis, you would choose to train Task 11 also.

This leaves only Tasks 3 and 10. Since you have already chosen 60 percent of the tasks for training and rejected 20 percent, you should rank order the remaining tasks. Since Task 3 has slightly higher ratings under most criteria, put it ahead of Task 10.

Your list of tasks now looks like this:

Tasks selected for training:

Task 2

Task 5

Task 6

Task 7

Task 11

Task 12

Undecided tasks (in rank order):

Task 3

Task 10

Tasks not selected for training:

Task 8

Task 9

Remember that you rejected Tasks 1 and 4 in Section 2.5. Therefore, they are not listed at all.

At this point, you are ready to get back with management and, as a team, make final selection decisions. At first it might appear that the only decision that has to be made, if you continue with the simple example that was just discussed, is what to do with Tasks 3 and 10. Which, if either, should be trained? If the decision were to train Task 3 and reject Task 10, this would mean 70% of the tasks would be trained. However, several other important factors must be considered.

1. The above example assumes that the cost in time, manpower, and other resources are equal for all tasks. Obviously

this is not always the case. Some resource estimates will be required by management from those responsible for the further development of this particular program. This is one reason for not initially selecting the exact number of tasks that management thinks can be trained. They really cannot know the exact number until they know which tasks you consider most important for training and how much it will cost to train these tasks.

2. Much of your selection data reflects the job "as it is," which is not always the same as "how it should be." Management must determine if "what is" is "what should be," and, if not, what kinds of changes are to be made.

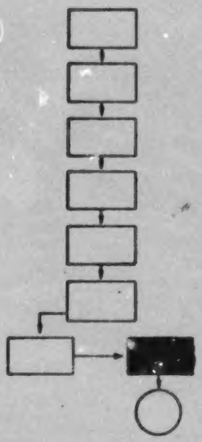
EXAMPLE

Suppose, in selecting tasks for training Dental Specialists, the task of "service dental instruments" was rejected on the basis of the small percent performing and small percent of time spent performing. The reason more Dental Specialists did not spend more time performing this task might have been that the currently used, newer dental instruments are too complex to be serviced by anyone who has not had special training.

If, as was assumed above, the task was rejected for training, there is little chance that newly trained Dental Specialists will know how to service the equipment. This means, when the job is analyzed again several years later, the task again will rate very low on percent performing and percent of time spent performing. If no one makes sure tasks selected for training are based on "what should be" rather than "what is," the task will probably be rejected for training again. This would mean that considerable expense would be incurred in purchasing new equipment because the original equipment was not properly serviced.

The preceding example points out the critical importance of basing your decisions on management determinations of what the job should be.

2.7 Secure Management Inputs and Approval



If you have asked for and received management inputs as you went through Section 2.6, your tentative lists of tasks, along with your recommendations, will be close to the final product of this block. While the decisions will be made by management, the quality of these decisions can be no better than the quality of information and recommendations you have provided.

3.0 OUTPUTS

The outputs of this block should consist of:

3.1 Products

1. Final list of tasks selected for training (See page 149 for an example.)
2. Summary of data collected upon which selection decisions were based (See Figure I.16 for an example.)

3.2 Other Documentation

1. Details of data collection
    a. Evaluation criteria selected and rationale for selection
    b. Survey sources
    c. Data collection forms used

2. List of tasks rejected for training in Section 2.5 and rationale for rejection
3. Management constraints on tasks selected for training
4. Recommendations presented to management
5. Any other pertinent information not included in the above

EXAMPLE

Final List of Tasks Selected for Training

A. Inspect Main Transmission

   1. Inspect main transmission oil system
   2. Inspect main transmission thermo-switch
   3. Inspect main transmission oil filter head assembly
   4. Inspect main transmission oil filter
   5. Inspect main transmission filter by-pass valve
   6. Inspect main transmission oil chip detector
   7. Inspect main transmission oil hoses
   8. Inspect main transmission lines
   9. Inspect main transmission fittings

B. Install Main Rotor

   1. Install main rotor blades
   2. Install main rotor blade trim tabs
   3. Install main rotor blade bolts

FIGURE I.16: Task Inventory Summary Sheet for OH-58 Helicopter Repairman

GEOGRAPHICAL AREA	CONTINENTAL UNITED STATES AVERAGE RESPONSE		ALASKA AVERAGE RESPONSE		HAWAII AVERAGE RESPONSE	
TASK:	A FREQUENCY OF TASK PERFORMANCE 1 Never 2 Less than once per month 3 At least monthly, but less than twice per week 4 Twice per week or more	B TIME BETWEEN JOB ENTRY AND TASK PERFORMANCE 1 Never Performed 2 Performed after 90 days 3 Performed within 90 days 4 Performed immediately	A FREQUENCY OF TASK PERFORMANCE 1 Never 2 Less than once per month 3 At least monthly, but less than twice per week 4 Twice per week or more	B TIME BETWEEN JOB ENTRY AND TASK PERFORMANCE 1 Never Performed 2 Performed after 90 days 3 Performed within 90 days 4 Performed immediately	A FREQUENCY OF TASK PERFORMANCE 1 Never 2 Less than once per month 3 At least monthly, but less than twice per week 4 Twice per week or more	B TIME BETWEEN JOB ENTRY AND TASK PERFORMANCE 1 Never Performed 2 Performed after 90 days 3 Performed within 90 days 4 Performed immediately
a. Service transmission oil system--main transmission						
1. Inspect main transmission oil system	3.2	3.9	3.0	3.9	3.3	4.0
2. Operational check on transmission oil system	3.0	3.3	2.9	3.6	2.8	3.5
b. Service de-ice system						
1. Remove de-icing valve lever	2.1	2.2	4.0	3.9	1.0	1.0
2. Service de-ice actuator	2.0	2.1	3.6	3.5	1.0	1.0
3. Remove actuator lever	2.3	2.4	3.8	3.6	1.0	1.0
4. Functionally check de-ice switch	1.9	2.0	3.8	3.9	1.1	1.4
c. Powertrain system components						
1. Install tail rotor drive shart	1.8	1.7	2.1	1.8	1.9	1.8
2. Install tail rotor gearbox	1.8	1.7	2.1	1.8	1.9	1.8
3. Install tail rotor hub	1.8	1.7	2.1	1.8	1.9	1.8
4. Install tail rotor blade assembly	1.3	1.6	1.2	1.5	1.4	1.5

APPENDIX A

ANALYSIS OF JOB DATA FROM CHECKLIST TASK INVENTORIES WHICH USE "RELATIVE TIME SPENT" RESPONSE SCALES

ANALYSIS OF JOB DATA FROM CHECKLIST TASK INVENTORIES WHICH USE "RELATIVE TIME SPENT" RESPONSE SCALES*

ATSG-EA
JULY 1974

---

*Information herein extracted/adapted from Christal, R. E., "Collecting, Analyzing, and Reporting Information Describing Jobs and Occupations: Comments by Chairman." In Proceedings of 19' Division of Military Psychology Symposium; Seventy-Seventh Annual Convention of the American Psychological Association, Washington, D.C., 31 Aug 1969 - 4 Sept 1969. AD774575. pps 77-94.

DERIVATION OF "PER CENT OF JOB TIME" DATA FROM "RELATIVE TIME SPENT" JOB DATA

1. Job data (Step 1) is obtained by job incumbents completing a checklist task inventory. Typically these task inventories contain 300 to 500 task statements. On each task, incumbents (see Figure 1):

   a. Check ("Check IF Done") the task if they have performed that task and,

   b. If performed, rate the task on a seven-place relative time spent scale. An individual indicates by rating a task "7" that he spends relatively more time on that task than other tasks he performs. A rating of "1" indicates the least amount of time spent in relation to all other tasks. In between ratings indicate various gradations between most and least amount of time spent.

A Tasks	B Check IF Done	C If Checked, Rate Relative Time Spent Least....Average....Most						
		1	2	3	4	5	6	7
1. Evaluate Work								
2. Plan and Schedule								
3. Change Dressings	✓	✓						
4. Make Beds	✓						✓	
5. Serve Meals	✓				✓			
6. Take TPR	✓					✓		
7. Administer First Aid								
8. Administer Injections	✓	✓						
9. Assist at Sick Call								
10. Drive Ambulance								

Figure 1. A completed checklist task inventory by one respondent (Case 3).

(A) Task No	D % Absolute Time Spent
1	
2	
3	5
4	34
5	25
6	30
7	
8	5
9	
10	

Figure 2. Total time spent per task

2. In step 2, the relative ratings resulting from each respondent (Step 1) are converted to total or absolute times spent per task. Example (see Figure 2):

   a. Case 3 rated 5 tasks (said he performed 5 of the 10 tasks). He rated these 5 tasks 1, 6, 4, 5, and 1. The absolute sum of the rating is 17 (1 + 6 + 4 + 5 + 1).

b. Case 3 spent 1/17 or 5% of his total work time on the task "change dressings." He spent 6/17 or 34% of his total work time on the task "make beds."

3. Figure 3 illustrates summary data resulting from 10 job incumbents on the same 10 item checklist task inventory.

a. Example of how Average Time Spent by Members Performing (Part G of Figure 3) was obtained. Two (20%) of the incumbents (cases) reported performing task 1. They averaged spending 75% of their total job time on task 1: Evaluate work (80 + 70 ÷ 2 = 75%). Four (40%) reported performing task 4: Make beds. They averaged spending 35% of their total job time on this task (40 + 40 + 34 + 25 ÷ 4 = 35%).

b. Example of how Average Time Spent by All Members (Part H, Figure 3) was obtained. Only two members (cases) reported performing Task 1. The average amount of job time spent by all members was 15% (80 + 70 ÷ 10 = 15%). On task 4, Make beds, all members averaged spending 35% of the work time (40 + 40 + 35 + 25 ÷ 10 = 35%).

(A) Task No	E % (performing)	F (% of Work Time Reported 1/ By Ten Cases for Each Task) 1	2	3	4	5	6	7	8	9	10	G Average % Time Spent By Members Performing	H Average % Time Spent By All Members
1.	20								80	70		75.0	15.0
2.	20								20	20		20.0	4.0
3.	70	10	5	5	20	10	10	5				9.3	6.5
4.	40	40	40	34	25							35.0	14.0
5.	40	30	35	25	20							27.5	
6.	70	20	20	30	25	30	40	15				25.7	18.0
7.	20							5			10	7.5	1.5
8.	60			5	5	50	40	40		10		25.0	15.0
9.	30					10	10	35				18.3	5.5
10.	10										90	90.0	9.0

Figure 3. Summary of Absolute Time Spent by 10 Job Incumbents (cases) on 10 Tasks.

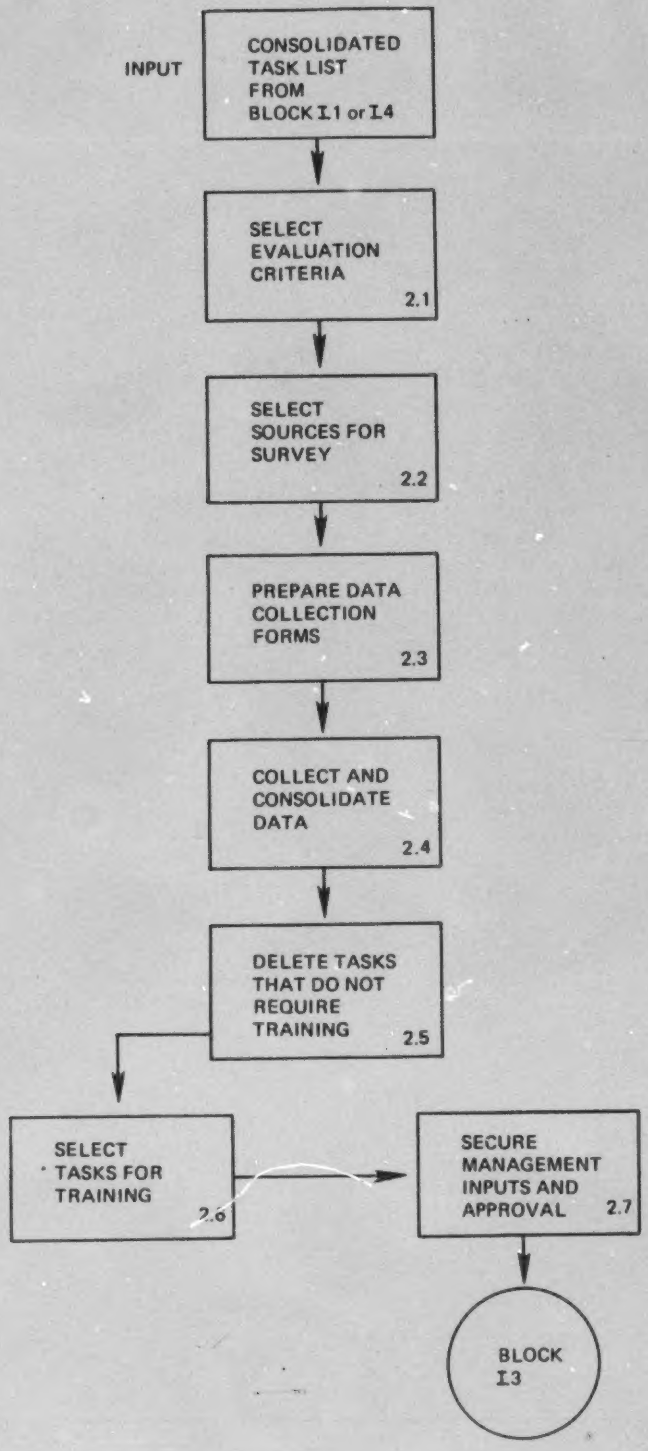
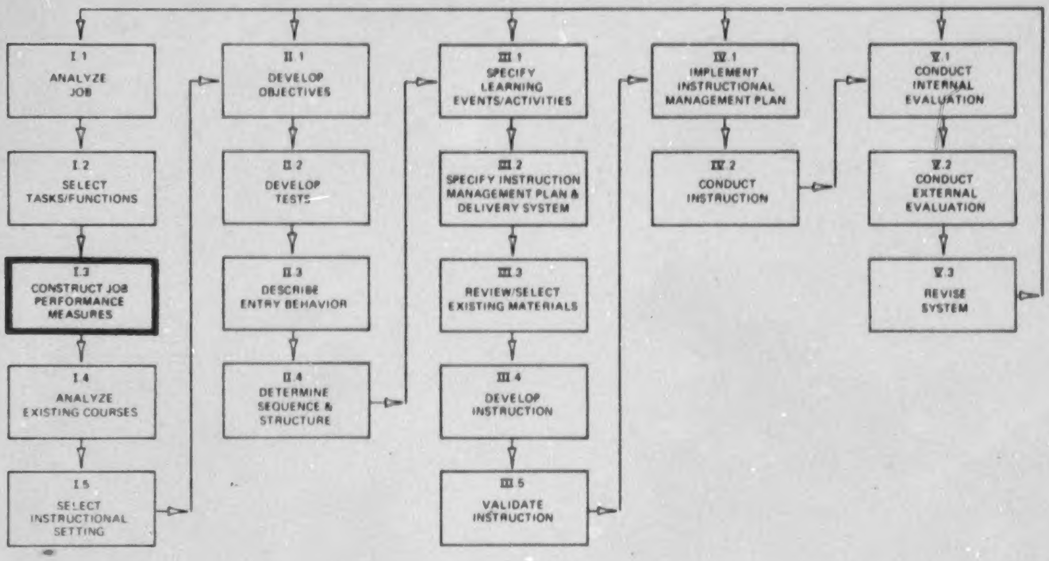

INPUT
CONSOLIDATED TASK LIST FROM BLOCK I.1 or I.4
SELECT EVALUATION CRITERIA 2.1
SELECT SOURCES FOR SURVEY 2.2
PREPARE DATA COLLECTION FORMS 2.3
COLLECT AND CONSOLIDATE DATA 2.4
DELETE TASKS THAT DO NOT REQUIRE TRAINING 2.5
SELECT TASKS FOR TRAINING 2.6
SECURE MANAGEMENT INPUTS AND APPROVAL 2.7
BLOCK I3

FIGURE I.12: Flowchart of Block I.2: SELECT TASKS/FUNCTIONS

BLOCK I.3: CONSTRUCT JOB PERFORMANCE MEASURES*


I.1 ANALYZE JOB
I.2 SELECT TASKS/FUNCTIONS
I.3 CONSTRUCT JOB PERFORMANCE MEASURES
I.4 ANALYZE EXISTING COURSES
I.5 SELECT INSTRUCTIONAL SETTING
II.1 DEVELOP OBJECTIVES
II.2 DEVELOP TESTS
II.3 DESCRIBE ENTRY BEHAVIOR
II.4 DETERMINE SEQUENCE & STRUCTURE
III.1 SPECIFY LEARNING EVENTS/ACTIVITIES
III.2 SPECIFY INSTRUCTION MANAGEMENT PLAN & DELIVERY SYSTEM
III.3 REVIEW/SELECT EXISTING MATERIALS
III.4 DEVELOP INSTRUCTION
III.5 VALIDATE INSTRUCTION
IV.1 IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN
IV.2 CONDUCT INSTRUCTION
V.1 CONDUCT INTERNAL EVALUATION
V.2 CONDUCT EXTERNAL EVALUATION
V.3 REVISE SYSTEM

OVERVIEW

Once the decision has been made as to which tasks will be trained, it is necessary to construct performance measures to test whether individuals can perform the tasks. These job performance measures (JPMs) become the fundamental basis for the development and control of training since they are the measure of the success of training. Unfortunately, many tasks, particularly combat tasks, cannot be measured directly. This results in a JPM being a compromise between resource constraints and the requirement for high predictive validity or fidelity.

---

*Portions of this material have been adapted from: Swezey, R. W. and Pearlstein, R. B. *Developing criterion referenced tests* (287-AR18(2)-IR-0974-RWS). Reston, Va.: Applied Science Associates, September 1974.

CONSTRUCT JOB PERFORMANCE MEASURES

1.0 INTRODUCTION

1.1 Rationale for Job Performance Measures

The procedures in Block 1.2, SELECT TASK/FUNCTIONS, produced a list of tasks selected for training. In this block, you will construct Job Performance Measures (JPMs) for those tasks. JPMs test whether or how well an individual can perform tasks.

A JPM is written at the task level. It represents the best approximation to a perfect test that can be made, considering costs, time, and ability to measure. A JPM measures one or more complete tasks. Job Performance Measures are used to:

1. Separate people into two groups: those who can satisfactorily do the task and those who cannot
2. Serve as the fundamental basis for development and control of training
3. Control the quality of the output (graduates) of training
4. Form the gasis for skill qualification tests, tests for promotion, tests to ensure that units are in an appropriate state of readiness, and any other measures of DOS proficiency

Using JPMs for all of the above assures some degree of compatibility in the training, evaluation, and personnel management systems and this multiple use justifies the investment required to construct and validate (make sure they test what they are supposed to test) the JPMs. Because so much depends on JPMs, a heavy responsibility is placed on those who construct and validate them.

While a JPM tests performance on a task, a Job Performance Test is a test used to determine whether or how well an individual can perform a job. A Job Performance Test may include either all of the JPMs for a particular job or a subset of the JPMs.

While Job Performance Tests are usually constructed by others, the Job Performance Measures developed here will be the basis for such tests.

1.2 Definition of Terms

Following are definitions of and brief discussions of some of the important terms used in this block.

1.2.1 Predictive Validity

A JPM is said to have good predictive validity if those who score high or pass the JPM are those who can perform the task well. The ideal JPM would have perfect predictive validity. Without exception, those who passed the JPM could perform the task, and all those who failed the JPM could not perform the task.

EXAMPLES

1. One of the tasks of a Motor Transport Operator is to complete the DA Forms associated with vehicle operation and maintenance. The JPM for this task is identical to the task. In this case, the predictive validity of the JPM would be very high.

2. Another task of a Motor Transport Operator is to drive a 5-ton truck with a trailer from a specified point to a specified destination. The task conditions require driving under a variety of conditions. The JPM is:

   Action: Drive vehicle with trailer,

Conditions	Standards
a. Over a ditch	without getting stuck
b. Over a rock bed	without getting stuck
c. Over a sand trap	without getting stuck
d. Down a steep slope	using proper gears and brake action
e. Up a steep slope	using proper gears

   In this case, the predictive validity probably would still be reasonably high. If an individual passed the test, he probably could perform the task. If he failed the test, he probably could not perform the task.

When it is practical to measure the task as it is actually performed on the job, it is possible to determine the predictive validity of the related JPM. In these cases, the primary objective in developing JPMs is to achieve the highest possible predictive validity, while, at the same time, keeping testing costs, time, and safety within acceptable limits.

Often paper and pencil tests can have high predictive validity. There are two types of paper and pencil tests which are particularly suitable for measuring performance. The first type concerns those tasks that are accomplished by using paper and pencil, e.g., a unit commander reviewing a strength report prior to authentication. In the performance of this task the job incumbent in the real world uses paper and pencil. The performance measure for this task therefore would have to use paper and pencil. Other examples are filling out forms and coding entries into data systems. Because they use paper and pencil in the real world, their JPMs should be paper and pencil tests.

The second type of task where a paper and pencil test would be applicable is one in which a mental discrimination is the most important aspect of the task. An example of this type might be the selection of an avenue of approach for an infantry attack. Assuming that the student is provided adequate information concerning the weather, enemy, and terrain, and that there were only six viable avenues of approach with one clearly best, there would certainly be no strong objection to having a paper and pencil test, even in multiple choice format (with 6 possible responses) requiring the student to select the most appropriate avenue of approach based upon the conditions given. This is a medium high physical fidelity test of the student's ability to select an appropriate avenue of approach and yet it is in a multiple choice paper and pencil format.

The major difference between the conventional multiple choice items and the use of a multiple choice format for performance testing of this type task is as follows:

1. Conventional multiple choice items generally utilize a short stem with little if any supporting reference material available. Performance items in a multiple choice format generally have longer detailed stems (which normally include the environment of the JPM) and always provide for use of any references available on the job.
2. Conventional items generally limit choices to 4 or 5 options while the number of options on a performance based multiple choice test vary and are dictated by the number

of options available in the real world. The option of doing nothing, for example, would normally be a reasonable field option but is rarely included in a conventional item.

1.2.2 Physical Fidelity

The physical fidelity of a JPM refers to the extent that the actions, conditions, cues, and standards of the JPM approximate those of the task. In the first example in the previous section, the JPM has the highest possible physical fidelity: JPM performance is identical to task performance. The second example has lower but still reasonably high physical fidelity. However, with these two examples, predictive validity is more important than physical fidelity. If a paper and pencil test or some other testing approach with considerably lower physical fidelity could be shown to have practically the same predictive validity, and if this testing approach were preferable in terms of cost, time and safety, it should be used. Unfortunately, having high physical fidelity does not ensure that predictive validity will be high. However, if predictive validity cannot be used, one must often settle for high physical fidelity.

EXAMPLE

> A gunner's mate must engage and hit attacking enemy high-performance aircraft according to a specific procedure and with a high degree of skill. This is a task for which he trained and which has immense payoff for the mission if it is done well. In order to determine whether he can or cannot perform this task, he would have to be tested and given a "go" or a "no go." This testing would have to be given under the exact conditions that would exist on the real job in combat.

> Circumstances prevent the administration of the test under real world conditions. First, it would be difficult to know which of a battery of gunners is responsible for a hit. Second, no one will be available to administer the test. Third, it would be foolhardy to administer a test under such dangerous conditions.

In this example, predictive validity cannot be used to determine the quality of the JPM for that task. Since there is no way to test the task under real world conditions, there is no way to test predictive validity. In cases like this the quality of the JPM is often based on the degree of physical fidelity between the JPM and the task.

Figure I.17 is a graphic presentation of some of the possible degrees of fidelity between JPMs and tasks.

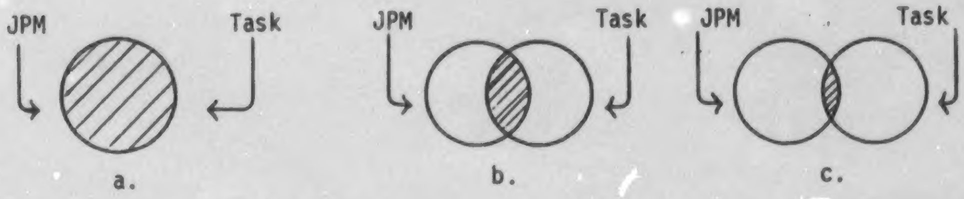


FIGURE I.17: Degrees of Physical Fidelity Between JPMs and Tasks

These three situations could represent the three examples used earlier. In the first example, performance of the JPM for completing DA Forms was identical to performing the Transport Operator's task. This is like "a" in the figure. In the second example, the JPM for driving the 5-ton truck with a trailer has reasonably high physical fidelity, but its performance is not identical to the task. This is like "b" in the figure. In the last situation, the JPM for the gunner's mate will have to be considerably different from the actual task. The physical fidelity, of necessity, will be lower. This is like "c" in the figure.

1.2.3 Simulation

Simulation, broadly defined, is any change from reality, or any imitation of reality. When a test cannot be given under real world conditions, some form of simulation must be used.

EXAMPLE

> A light-weapons infantry task might involve engaging enemy soldiers under combat conditions; that is, the soldier himself would be in jeopardy. Without a war, an enemy cannot be provided to engage. We would not endanger the soldier's life by having him under fire just to test his performance. Therefore we cannot provide a high fidelity initiating cue; the soldier will not be shot at, nor will he have to seek out enemy troops. There is no way to supply the same element of danger without truly endangering him. The JPM would be more like "c" in Figure I.17. However, we can simulate the initiating cue and have him go through some or most of the steps, and we might provide battle sounds. The initiating cue can range from an order to fire at a paper target to the appearance of a simulated figure (there is one called Punchy Pete) that will appear randomly and fall if hit in a critical spot.

In this example, the battle sounds provided, the paper targets, or the "Punchy Pete," and any other imitations of the real world task are simulation.

1.2.4 Unitary Tasks

Another factor that effects construction of JPMs is whether the task is unitary or multiple. A unitary task is one that is always performed in exactly the same way with exactly the same inputs.

EXAMPLE

> "disassemble an M16 rifle" and "assemble an M16 rifle" are unitary tasks. The input, the rifle is always the same; and the task is always performed in the same way.

1.2.5 Multiple Tasks

A multiple task is one that has a number of possible inputs. There are two types of multiple tasks. One type is always performed by following basically the same procedure.

EXAMPLE

> A task requiring multiplication of three-digit numbers by three-digit numbers is a multiple task. The multiplication is always performed by following basically the same procedures; however, there are almost one million possible inputs or combinations of the two sets of three-digit numbers.

In this example, it would be impossible to test all possible inputs to make sure an individual knows how to do them all. For unitary tasks, the JPM can measure the total; however, for multiple tasks a representative sample must be used.

The other type of multiple task is one in which the inputs vary, and the task is performed differently depending on the input. This means the input is a cue that determines the appropriate response.

EXAMPLE

> One task for a Military Policeman is to apprehend a violator. The procedure for performing the task depends heavily on the cues. For example:
>
> Is the suspect armed or not?
> Is the suspect military or civilian?
> Is the suspect drunk or sober?
> Is the suspect in a vehicle or on foot?
> Is the suspect alone or with others?
> Is the MP alone or with others?
> Is the MP in a vehicle or on foot?
> Did the alledged crime take place in a restricted area or not?
>
> Answers to questions like these will determine how the task is performed.

As with the first type of multiple task, the JPM for this task cannot measure the total task but must test a sample of the possible variations. However, for this type of task, the JPM must do more than measure the adequacy of the performance. It also must measure the appropriateness of the performance; that is, whether the performance was the correct responses to the particular cues.

1.3 Overview of Construction of JPMs

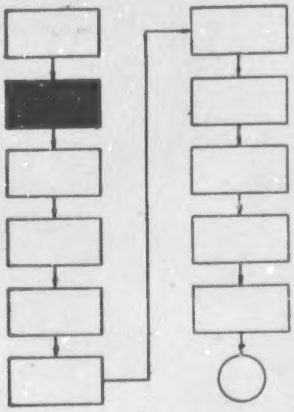
JPMs, like tasks, are statements of action to be taken. JPMs also have a statement of conditions under which the JPM is administered, cues that indicate the need for particular responses, standards that are a measure of the adequacy of performance, and elements that are the actions that make up the total performance.

As was mentioned earlier, the inputs to this block were the tasks selected for training, along with their conditions, cues, standards, and elements. The procedure for developing JPMs is basically one of considering in what ways the JPM must be different from the task, because of various testing constraints, and constructing a test that is the best compromise. The steps in this procedure are shown in Figure I.18, the foldout page at the end of this block. The outputs of this block will include a JPM for each task.

2.0 PROCEDURES

Following are a number of steps in the procedure for developing and validating JPMs. For the steps discussed in Sections 2.1 - 2.9, the correct procedure is first to go through these steps for each task. That is, take one task, determine the testing contraints, make the various decisions discussed in Sections 2.2 thru 2.8, and develop the JPM. Then take the next task and do the same. The first decisions will be tentative; after you have worked through a small group of tasks, you may wish to go back and make changes. Then, after you have developed all of the JPMs, and scoring procedures, validate the items as discussed in Section 2.10.

2.1 Determine Testing Constraints



If there were no constraints of time, money, personnel, facilities, and other resources, every JPM could be identical to the task it is intended to measure. That is, the JPM would consist of observing the job incumbent while he performed the task on the job and noting whether or not he met the job standards. However, since these constraints do exist, the JPM often will be different from the task. The first step in developing JPMs that have high predictive validity, high physical fidelity, or both is to analyze the task to determine what testing constraints apply to that particular task. The following practical constraints can force a change from a higher to a lower physical fidelity JPM. Note that these constraints are all interrelated. For example, time availability, manpower availability, equipment availability, and costs are often all different aspects of the same problem.

1. Time. The first type of practical constraint, time availability is easily understood. Often the situation is such that it is impractical to test the task, as it is stated, in the available time.

EXAMPLES

> Perhaps the job task requires an extended march through marshy terrain during inclement weather or watching a radar scope for blips for long periods, maintaining proper vigilance as indicated by detecting all blips during the interval.
>
> Since both of these examples would take much too long to test in most situations, they must be modified to permit testing in less time.

In general, time limits must be placed on test administration which in turn limits the amount of time that can be spent on each JPM. If performance of some of the tasks requires more time than is available for testing, the JPM can use a sample of the task elements.

2. Manpower. Manpower availability can also impose practical constraints.

EXAMPLE

> If under normal conditions it takes 4 men to operate a main battle tank, a commander, driver, gunner, and a crewman/loader, and you want to test assistant crewman/loaders under normal operational conditions, personnel trained in the functions of commander, gunner, and driver will be required for the test. If these personnel are not available, there will be insufficient manpower for conducting the assistant crewman/loader test under normal operating conditions.

In the above example, it would be preferable to arrange JPMs for the whole crew simultaneously, but care must be taken to ensure that each position is scored separately.

3. Costs. Cost is another important factor in developing JPMs. The cost of test administration must be kept within the limits dictated by the testing budget of the facility where the test will be used.

EXAMPLE

> It would be entirely too costly (and unreasonable) to have a demolition specialist destroy a bridge to test his ability to achieve maximum damage. There must be other more practical means of testing this task. If the task specifies demolishing a bridge, the JPM may need to be modified so that the bridge is not actually demolished, but the job incumbents demonstrate the process up to but not including the demolition.

4. Facilities/equipment. Often, sufficient equipment or facilities are not available for test administration. This is especially true for sophisticated equipment and very specialized facilities.

EXAMPLES

> A serious facility constraint exists when a job incumbent must demonstrate competence in escape and evasion in a tropical jungle if the testing must take place in the Southwestern United States. An extreme example of a facility-caused constraint is firing a missile down range, since at many test sites it is impossible to obtain a suitable test range.

An example of a severe practical constraint concerning equipment availability might involve a course on troubleshooting a terrain-following radar system. The preferred JPM may include planting a bug in the system and having a job incumbent locate the problem and replace or repair the necessary parts. However, this radar system is sufficiently complex and costly that testing is prohibited on the actual equipment. Another example is troubleshooting a computer: The downtime of the computer may be so costly as to negate its use for testing purposes.

If you have many tasks for which testing would tax facilities/equipment beyond feasible limits, it may be possible to select for testing those tasks which would cause least damage or inconvenience. The remainder of the tasks might be simulated.

5. Other constraints. There are other less common practical constraints which you may encounter in the development of your tests. These constraints include:

1. logistics
2. supervisory effectiveness
3. communications
4. ethical considerations
5. legal considerations

Remember that in most cases constraints are interrelated. The practical constraint in the example of the terrain-following radar system was categorized under equipment availability, but it could also be categorized under costs.

Considering the limitations in equipment, personnel, time, space, safety requirements, and other factors, it is obvious that complete fidelity is not always practical or even desirable. In these cases, the JPM developed must be viewed as the best possible trade-off with reality.

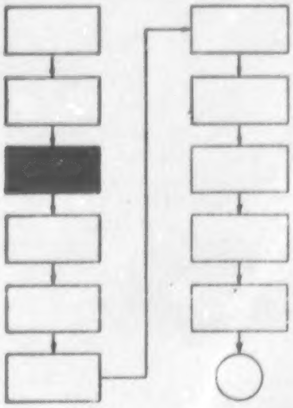
If, for your particular task, no constraints exist that prevent you from using the actual task as the JPM, you will not be forced to make trade-offs. Fortunately, quite a few tasks fall into this category.

EXAMPLES

1. The JPM for "rotate tires on 1/4-ton truck" could be identical to the task.
2. The JPM for "complete DD Form 314, Preventive Maintenance Schedule and Record" probably would be identical to the task.

2.2 Determine if Product, Process, or Both Should be Measured

The task standard was based on a product, process, or both. This was discussed in detail in Section 1.2.7 of Block I.1



The end product is the most obvious task output; it can be observed and inspected. A tactical operation plan, a computer program, or the results of a desk audit of an initial draft computer program are all products or terminating boundaries of tasks.

The other output which signals the terminating boundary of a task is the completion of the process involved. The process itself leaves no record. The skills involved (for instance, in driving a tank) can best be evaluated by observation.

In some cases, product and process must both be examined as task output. Many tests evaluate processes which result in products in order to provide feedback on process errors which effect the product or related policies and practices.

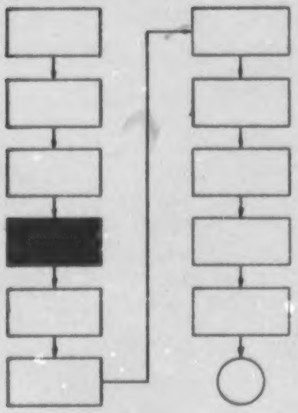
In certain cases, processes in a task may be critical in that they insure personnel safety or prevent equipment damage. For instance, a driver may arrive at destination B from point A as required by the task but, in the process, violate many laws and safety regulations. In such cases, product evaluation by itself is not always adequate.

The JPM will usually measure the same factors, product, process, or both, used as a basis for the task standard; however, this is not an essential practice. If considerable simulation will be required, it may be more practical to measure another factor.

EXAMPLE

> The standard for the Demolition Specialists' task of "demolish bridges" might be that he completely destroy the bridge without injury to himself. The JPM would probably measure the procedure used rather than the product.

2.3 Determine Simulator Requirements



Simulation is defined broadly as any change from, or imitation of reality. However, since simulation as a result of changes in conditions, cues, and standards will be discussed in the following sections, only changes in the basic task related equipment or facility are discussed here.

Earlier it was stated that there are occasions in which no JPM can be given under actual job conditions because of cost, danger, etc. But, some tasks are so important to mission success or must be done so well that failure to satisfactorily perform them significantly reduces the chances of mission success, endangers lives, or damages equipment. The function of this section is to discuss the development of simulators used principally for JPMs for the evaluation of job incumbents, not for instructional purposes. However, there is always the possibility of using the simulator for both. Remember the Apollo missions were flown successfully by men who had been trained and tested on simulators.

Each service has its own procedures for specifying and developing requirements for simulators. Ordinarily, these would have been generated when the new process or system was still on the drawing boards.

EXAMPLE

> Experience gained by our forces or by others can quickly change the requirement for job proficiency. In the 1967 Arab-Israeli conflict, there were improvements in range and shooting accuracy of

> the tankers based on WW II data. Between 1967 and the Yom Kippur war, range and accuracy increased dramatically again.
>
> These changes in performance were traced directly to training. In order to maintain the ability to engage enemy armor successfully at the increased levels of proficiency required, laser simulators were developed. These high fidelity devices, such as Multiple Integrated Laser Engagement Simulator (MILES), permit accurate scoring of hits and provide excellent opportunities to measure the performance of crews under simulated combat conditions.

The requirements for these simulators were not specified at the time that the main battle tank was delivered. The requirement resulted from careful analysis of field performance by crew and experience gained by others. The JPM developer will often discover needs for increasing the fidelity of JPMs based on critical new information of the type described. If he is a specialist in the DOS in question, he may know from his own experience of deficiencies in performance that could make important differences to mission accomplishment. Occasionally field use of hardware and systems indicates the need for improved job performance, or unanticipated system performance or configurations require a reordering of tasks selected for training. In those situations, the developer of the JPMs should investigate the potential value of a simulator in the total system.

The use of simulators for training will be discussed further in the sections of the manual dealing with the development of instruction. Many trade-offs may be necessary in order to arrive at good decisions about the procurement of simulators. (Some of these would be directly tied to training considerations, time saved, cost of simulators compared to alternative means, and other factors.)

Three logistical factors will have a direct bearing on a decision to use simulators:

1. Downtime. What is the effect on the readiness, effectiveness, and efficiency of the unit when operational personnel or equipment is used for measuring performance?
2. Cost. What is the cost of using personnel, equipment, and materials resources for measuring performance?
3. Damage or Danger. What are the potential damages or dangers to personnel or equipment as a result of the performance measurement?

As the JPM is designed for each task on your list, you should consider each of the above logistical factors. Rate each as:

1. Serious. It has major consequences to mission operations.
2. Average. It has moderate consequences to mission operations.
3. Negligible. It has little consequence to mission operations.

If in rating the factor with regard to the three logistical factors (downtime, cost, damage or danger), you find that none of the factors are rated "serious" and no more than one of the factors is rated "average," you cannot justify large expenditures for a simulator for the JPM. However, if most of the factors are rated "serious" or "average," you should give serious consideration to the use of a simulator.

Another consideration is the lead time to procure simulators. If the JPM is designed requiring a simulator that will take years to go through the approval, design, and production cycle, it will not be useful six months from now when you are conducting external evaluation.

If it is determined that simulation is required, you must decide what type of simulation is necessary. For some purposes, the resemblance should be very close. For other purposes, high-fidelity simulation is not necessary. Three common types of simulation are:

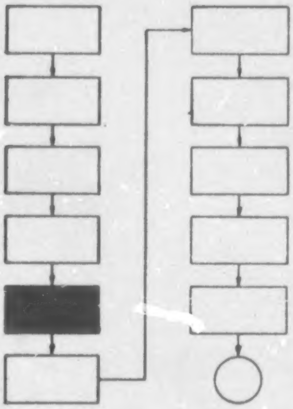
1. Simulating Part of the System. You may want to explore questions of operator performance, safety features, etc. To do this, you may decide to create a mock-up of a particular piece of gear. The sophistication of the mock-up will vary. In many situations, fully operational or high-fidelity mock-ups or trainers are not required. Situations requiring full-scale trainers are usually determined in the early stages of system design. The trainer design and development is usually accomplished by a contractor.
2. Simulating the Operation of a System. System operation can be simulated in several ways. One technique is "talk-through," or a computer can be used to simulate operational activities; or complex simulators can replicate the job conditions. The characteristics of the first two techniques are shown in Table I.5.
3. Simulating the Environment in Which the System Will Operate. The most frequent source of error in modern systems is due to variability in human performance. You may use a variety of techniques for determining under what conditions people will have difficulty operating the system. One way is to let real people operate the system using simulated inputs. By simulating system inputs, you can create stressful situations (for example, an overload condition) and observe what

TABLE I.5

Simulating the Operational System

TALK-THROUGH TECHNIQUE	COMPUTER MODELS TECHNIQUE
Involves talking through each operation in the new system to determine decisions and contingencies.	Involves having a computer simulate the major operations of the system, under a variety of conditions.
Results: * Depicts human functions at flowchart level. * Major decisions are rationally identified. * Required actions and alternatives are rationally determined. * Information gaps requiring assumptions are identified.	Results: * Functions of system and assumptions of personnel performance are reduced to logic statements. * The model of the system is "run" many times under different conditions. * Shortcomings of system operation are identified.

happens. Such techniques are particularly useful for identifying in advance the mistakes people make. If they occurred in actual operation, these mistakes might be very costly.



2.4 Determine JPM Conditions

Conditions may be constant or they may vary; this includes factors that cannot be controlled, such as weather and the amount of natural light, and factors that can be controlled. All such JPM conditions should be listed.

EXAMPLE

ACTION:

For the task "remove/install main transmission mast assembly" on an OH-58 Helicopter, the conditions listed are:

CONDITIONS:

Sheltered area
TM 55-1520-228-20
TM 55-1520-228-35
General mechanics tool kit
Suitable maintenance platform
Suitable stand to hold mast
Wrench T101500
Holding Fixture T101499

The above conditions are fairly constant; in order to do the job, you would choose to have all of the above. In such cases JPM conditions match job conditions. For other jobs the conditions must be sampled for any one JPM. It is difficult to combine blizzards and desert in one measure.

EXAMPLE

A land navigation task would be to get from point A to point B. The constant conditions listed are:

A map of the locale
Lensatic compass

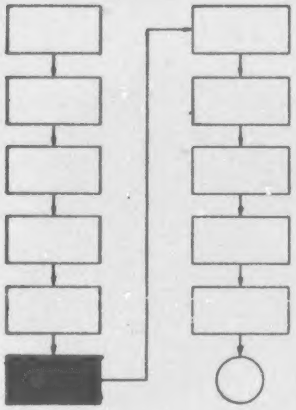
The variable conditions are:

All types of weather
Across all terrains
At any time of day

In developing the JPM, all the conditions that would make a difference in performance of the JPM must be listed for each factor. In the previous examples, in addition to the fixed conditions of a map of each locale and a lensatic compass, there must be:

1. All possible types of weather--dry, damp, rain, snow, clear, high wind, light wind, no wind, below freezing, temperate, hot, etc.
2. All types of terrains--plains, cities, deserts, forests, towns, villages, hills, mountains, etc.
3. Any time--daytime, nighttime with stars, no stars, moon, no moon, etc.

If testing constraints preclude using all the conditions, you will be forced to use a sample of them. You should include those conditions you think will best reflect ability to perform under all the conditions.



2.5 Determine JPM Cues

Often the JPM cues must be different from the task cues even though this reduces the fidelity of the JPM.

EXAMPLE

> The cue for a medical corpsman to perform mouth-to-mouth resuscitation would be that the casualty was not breathing. However, this would not be a realistic cue for the JPM. While changing the cue reduces the fidelity of the JPM, probably the best that could be done would be to use a cue such as having the test administrator say, "At this station, the casualty (dummy) next to you is unconscious. You find a weak pulse. He has stopped breathing. Take immediate action."

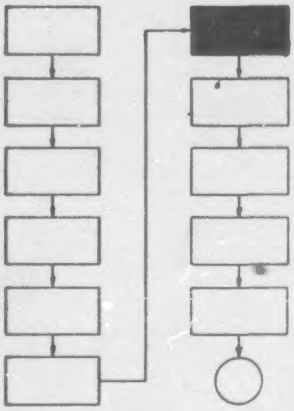
Insofar as constraints permit, the critical cues should be realistic. A critical cue is one for which the proper response determines success or failure in performing the task.

EXAMPLE

> The task of "repair malfunctioning equipment" might be such that the actual repairs are relatively simple if you know which one to make. The critical part of the task might be determining which repair to make. In this example, if the JPM cue were having the test administrator say, "Assume equipment requires repair A," the JPM would have very low fidelity and probably very low predictive validity.

2.6 Determine JPM Standards

Performance measures must have specific standards which are applied to all persons taking the test so that each person is rated like all others. JPM standards usually include time limits and required procedures; some will describe the product required and criteria for judging that product. Time limits simply mean that the skill must be performed correctly within a certain time. The time limits may be set by the task.



EXAMPLE

> After you remove the pin from the hand-grenade and release the handle, there is a fixed number of seconds before the grenade explodes. The time limit for tossing it must be well within that time limit.

Other standards may also be set by the task.

EXAMPLE

> A fragmentation grenade of the M26 or M56 type has an effective casualty radius of 15 meters. It can be thrown approximately 40 meters by the average soldier. The standard for distance thrown must be set somewhat over 15 meters but cannot be set over 40 meters if you want achievable standards.

Some standards, especially time limits, are not job directed. That is, these tasks rate very high on Task Delay Tolerance. In addition to having implications for training, this factor also affects performance testing.

EXAMPLE

> One of the more probable sources of a performance standard is that developed by the test designer or performance evaluator. For example, it may be that there are no verifiable real-world job performance speed requirements that have ever been discovered. "Change wheels on ¼-ton trucks" may be required of a driver. However, if we add the condition of "muddy terrain" and the standard "within three minutes," we may have used the test to set the standard when there was no standard implied in the task. It might be troublesome if the driver required two hours to perform the task, but what if it only took six minutes? To the statistician that means being off by a factor of 100%--a powerful error; but to the driver, it may be only a minor problem. Unless there are real field requirements for stated conditions and standards, they should ordinarily be stated to the minimum requirement. In the case of changing wheels, it may be necessary to do a time and motion study just to discover a 3-minute tire changing procedure, when almost anyone could do it in 6-10 minutes.

Such unnecessarily high standards are very costly in testing efforts and of dubious value in decision making.

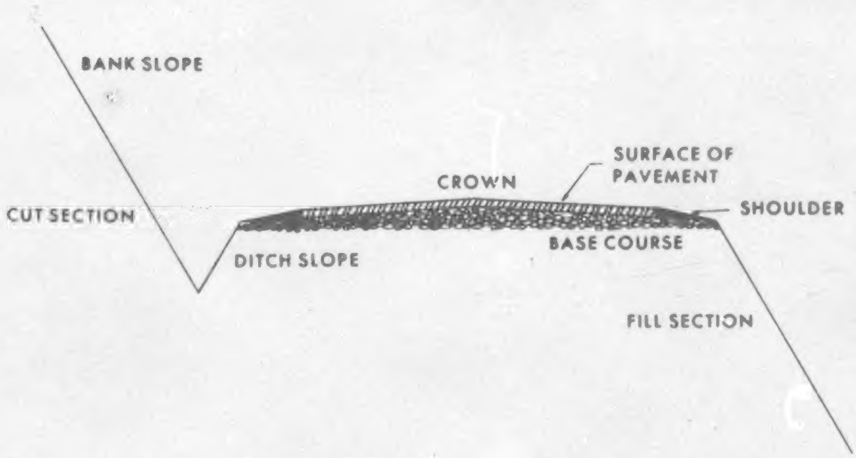
Standards relating to procedures require that certain steps be followed in the performance of the task. If certain steps are omitted or done in the wrong order when order is important, then the person does not meet the standard. The idea behind the use of such a standard is that there is no such thing as performing some skills half-right and half-wrong. Either a person can stand at attention or he cannot; there is no half-way point. Some performance measures may include a margin of error. For example, a performance measure in land navigation may allow a soldier to plot an azimuth within a tolerance of plus or minus two degrees. If his answer falls within that range, he has met the standard. Other tests may allow a person to vary the order in which he performs certain steps of a procedure, because the order is not critical.

Some standards may include requirements related to final products. Sometimes, procedures followed in turning out the end-product may be less important than the quality of the product itself. However, if procedures are followed correctly, the chances that the product will meet the standard should be improved.

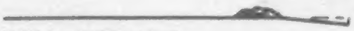
Some jobs could be measured on both process and product.

EXAMPLE

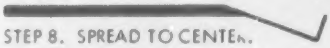
> If the product is a graded road, it could be scored based on a set of criteria such as bank slope, ditch slope, crown, surface appropriate to the terrain and intended use. (See the following illustration.)



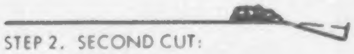
The same road could be measured while it is being constructed on each step in the procedure (as illustrated below).



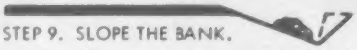
STEP 1. DITCH LINE: LIGHT CUT.



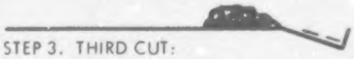
STEP 8. SPREAD TO CENTER.



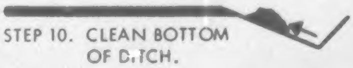
STEP 2. SECOND CUT: HEAVY.



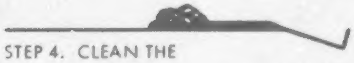
STEP 9. SLOPE THE BANK.



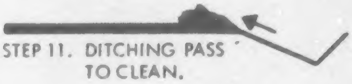
STEP 3. THIRD CUT: HEAVY.



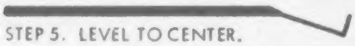
STEP 10. CLEAN BOTTOM OF DITCH.



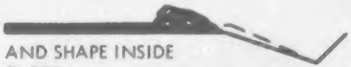
STEP 4. CLEAN THE SHOULDER.



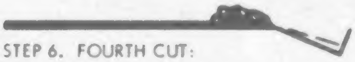
STEP 11. DITCHING PASS TO CLEAN.



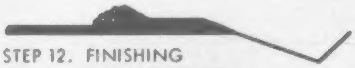
STEP 5. LEVEL TO CENTER.



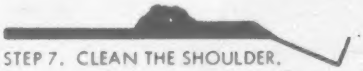
AND SHAPE INSIDE SLOPE.



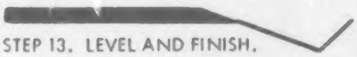
STEP 6. FOURTH CUT: HEAVY.



STEP 12. FINISHING SHOULDER PASS.



STEP 7. CLEAN THE SHOULDER.



STEP 13. LEVEL AND FINISH.

NOTE
STEPS SHOWN ARE FOR ONE SIDE.
REPEAT ON OPPOSITE SIDE OF ROAD.

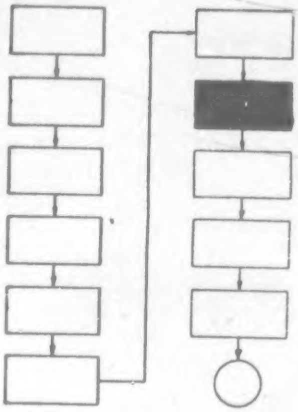
Another class of performance standards are highly qualitative, such as those for briefings, staff studies, and tactical plans. The effectiveness of an oral briefing is difficult to break down into elements that can be objectively scored on a right-wrong basis. A number of tactical plans might be good; some may be better; but only one may be best. Evaluation of their worth, however, is judgmental and qualitative rather than quantitative. You must be careful when you evaluate such intellectual and qualitative task performances to be sure that you do not just measure the less important part of the tasks that are more easily scored. Even though evaluation of these tasks is mostly judgmental and qualitative, a quantitatively measurable standard for performance measurement purposes must be derived.

EXAMPLE

> Classroom instruction can be based on military standards like:
>
> > Classroom is clean.
> > Instructor's shoes and brass are shined.
> > Instructor varies the volume of his voice, etc.
>
> Additionally, standards can include performance levels for the instructor's trainees:
>
> > The trainees will make a score of 75% or above on the posttest.
> > The trainees will reach criterion in less than one week.

2.7 Determine if All or Part of the Task Will Be Tested

The decision to test all or part of the task depends largely on whether it is a unitary task or a multiple task. For unitary tasks, that is, tasks that have only one doctrinally correct procedure, all of the task is tested.



EXAMPLE

A unitary task is making VOR receiver check.

VOR RECEIVER CHECK

Check the VOR receiver during the "Before Taxi Checklist" using the following procedure:

1. Tune and identify the station--listen for the voice or Morse code identifier.
2. Center the course indicator with a TO indication by slowly rotating the course selector.
3. Move the course selector 10° to the left. The course indicator should deflect (move) all the way to the right. Then move the course selector 10° to the right of the original course. You should note full deflection of the course indicator to the left. This procedure ensures freedom of movement of the course indicator.
4. Move the course selector 90° from the original course. The TO indication should disappear, and the FROM indication should begin to appear. This procedure ensures that the ambiguity (whether you are going to or from the station) features of the VOR are working.

In the above example, all of the task is tested and the JPM is basically identical to the task.

EXAMPLES

1. If a task includes multiplying three-digit numbers by three-digit numbers, there are almost one million possible combinations. You will test only a part of this task.

2. If the task is:

Job task (OH-58 Helicopter Mechanic) 4.119/5

Task: Troubleshoot Main Transmission Oil System
Conditions: 1) Outside if weather and lighting permit or under shelter
2) TM 55-1520-228-20
TM 55-1520-228-34
General mechanics tool kit
Pressure gauge 0 to 100 lbs psi and multimeter
3) OH-58 Helicopter
Standards: 1) Locate and isolate the cause of any abnormal indicators within (time frame)
2) Observe safety precautions

The JPM might be:

Job Performance Measures for Task 4.119/5

Task: Troubleshoot Main Transmission Oil System
Conditions: 1) Outside if weather and lighting permit or under shelter
2) TM 55-1520-228-20
TM 55-1520-228-34
General mechanics tool kit
Pressure gauge 0 to 100 psi and multimeter
3) OH-58 Helicopter
Standards: 1) Locate and isolate the cause of the following abnormal indicators:
(1)
(2)
(3)
...
(n)
2) Observe all safety precautions
3) Locate and isolate within (time frame)

If there are only three or four abnormal indicators, you will probably include them all in one test. If the number of possible abnormal indicators is large, you may construct alternate forms of the JPM, each of which includes several of the possibilities.

3. The multiple task "identify MOS and grades to announce for promotion recommendations" might look like the flowchart (Logic Tree) in Figure I.19. To perform this task, some of the first steps are:

   Determine if the position is authorized E4, E5, and E6.

   Determine if the position is vacant.

   Are there individuals on the merit list?

   .

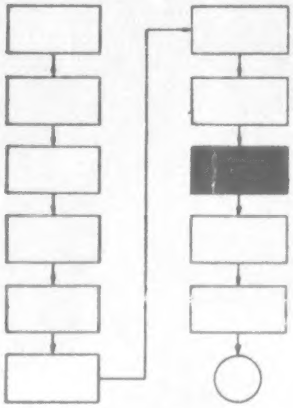
   .

   For each answer to these questions there is a different path to take. Any one case would only go on one of the possible paths. However, there are a finite number of cases that will test all possible decision points and paths. This number of cases makes up the pool from which you can construct alternate forms of the JPM.

Look at your list of actions, standards, conditions, cues, and constraints. What can you realistically do? If you can test the whole task, do it. If not, develop a part-task test that will predict job performance. You will validate these measures and have an opportunity to revise them later. The next section discusses a sampling plan for use with part-task tests.

2.8 Develop Sampling Plan

At this point, you have identified tasks, conditions, cues, and constraints, made a decision on testing whole or parts of each task, and specified what output(s) you will measure. For all those factors listed above that are unitary (present

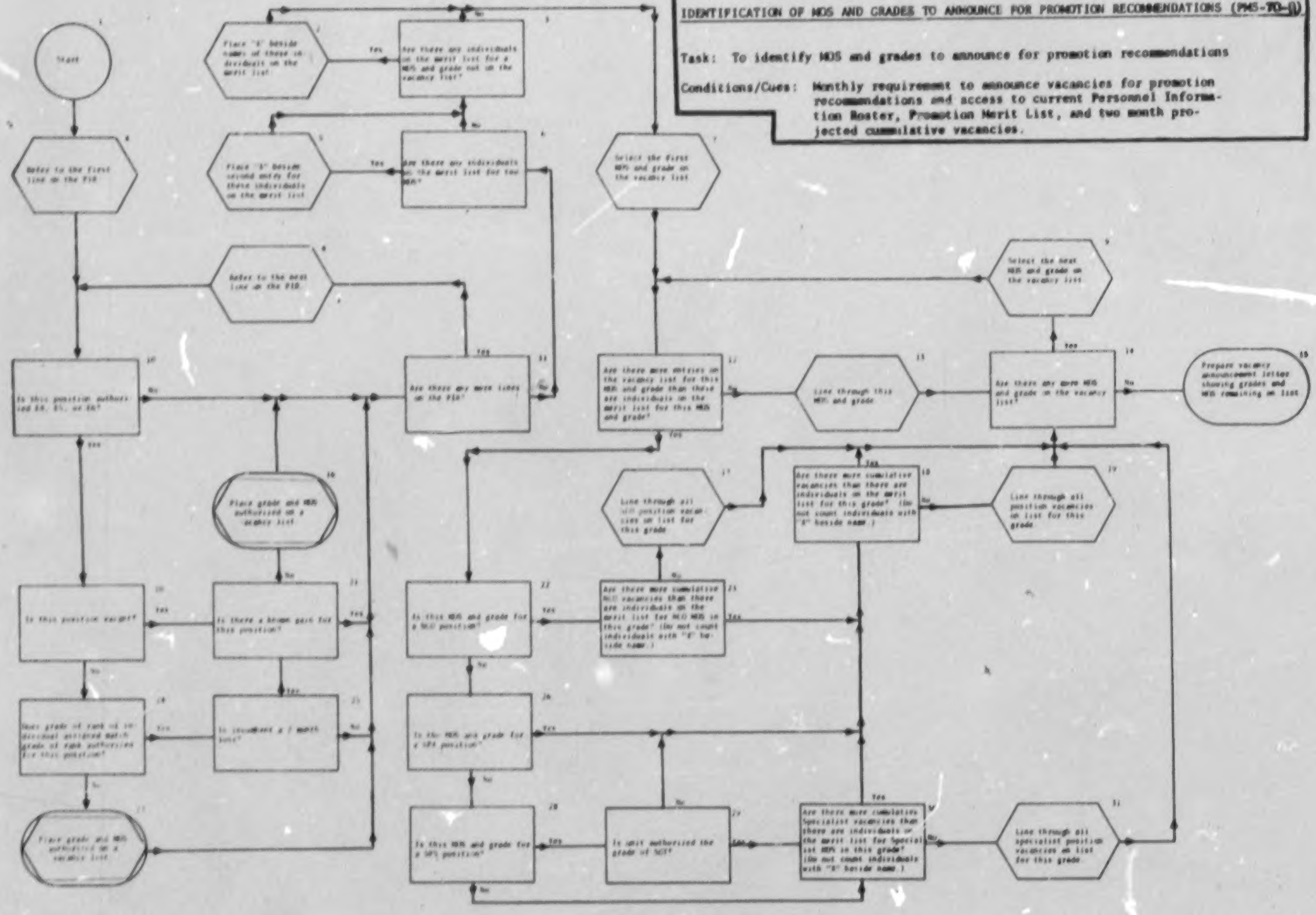


LOGIC TREE FOR:

IDENTIFICATION OF MOS AND GRADES TO ANNOUNCE FOR PROMOTION RECOMMENDATIONS (PMS-TO-1)

Task: To identify MOS and grades to announce for promotion recommendations

Conditions/Cues: Monthly requirement to announce vacancies for promotion recommendations and access to current Personnel Information Roster, Promotion Merit List, and two month projected cummulative vacancies.



1 Start
2 Refer to the first line on the PIR
3 Are there any individuals on the merit list for a MOS and grade not on the vacancy list?
4 Place "X" beside names of these individuals on the merit list
5 Are there any individuals on the merit list for two MOS?
6 Place "X" beside second entry for these individuals on the merit list
7 Select the first MOS and grade on the vacancy list
8 Refer to the next line on the PIR
9 Select the next MOS and grade on the vacancy list
10 Is this position authorized E4, E5, or E6?
11 Are there any more lines on the PIR?
12 Are there more entries on the vacancy list for this MOS and grade than there are individuals on the merit list for this MOS and grade?
13 Line through this MOS and grade
14 Are there any more MOS and grade on the vacancy list?
15 Prepare vacancy announcement letter showing grades and MOS remaining on list
16 Place grade and MOS authorized on a vacancy list
17 Line through all NCO position vacancies on list for this grade
18 Are there more cumulative vacancies than there are individuals on the merit list for this grade? (Do not count individuals with "X" beside name.)
19 Line through all position vacancies on list for this grade
20 Is this position vacant?
21 Is there a known gain for this position?
22 Is this MOS and grade for a NCO position?
23 Are there more cumulative NCO vacancies than there are individuals on the merit list for NCO MOS in this grade? (Do not count individuals with "X" beside name.)
24 Does grade of rank of individual assigned match grade of rank authorized for this position?
25 Is incumbent a 2 month loss?
26 Is this MOS and grade for a SP4 position?
27 Place grade and MOS authorized on a vacancy list
28 Is this MOS and grade for a SP5 position?
29 Is unit authorized the grade of SGT?
30 Are there more cumulative Specialist vacancies than there are individuals on the merit list for Specialist MOS in this grade? (Do not count individuals with "X" beside name.)
31 Line through all specialist position vacancies on list for this grade
Yes
No

FIGURE I.19: Logic Tree

only one option), there is no need to sample; use that factor. When there are multiple possible actions, conditions, or cues, you must decide if they are all equally likely to occur and if there is the same criticality involved with the occurrence of each one. If they are equal, sample equally from them until each is included in one alternate form of the JPM.

EXAMPLE

Task: Field Strip an M203 Grenade Launcher
Conditions: Night, day; rain or shine
Initiating cues: Malfunction x, y, or z (all equally likely to occur)
Standard: in 2 minutes

For your sampling plan you would choose the one action and combine it with each of the selected conditions and each initiating cue. There are two choices for each condition and three initiating cues so, to test all of them, you will have six JPMs.

If the likelihood of occurrence or the criticality is unequal, then the sampling plan should reflect that.

EXAMPLE

Task: Troubleshoot the engine in an OH-XX
Conditions: TM XXX
TM XXX
Tools
Shelter
Initiating Cues: Malfunctions A-G, H-P, Q-Z
Standard: OH XXX must function

For your sampling plan you would choose the action, conditions, and standard from the task list. Eighty percent malfunctions that occur are A-G, 10 percent are H-P, and 10 percent are Q-Z. In addition, malfunctions H-P, if not corrected immediately, will

> destroy the engine; while malfunctions Q-Z make terrible noises but do not cause permanent damage. For each alternate form of the JPM, you might plan to take 4 malfunctions from the A-G group, 2 from the H-P group, and 1 from the Q-Z group. You need to weigh the likelihood of occurrence and the criticality of the malfunction to decide how many to sample from each group.

Several of the above examples use the term "alternate form of the JPM." These alternate forms are equal but different versions of the JPM. Constructing alternate forms makes it possible to include all of the important variables without making any single test too long to administer. However, occasionally, it is not practical to construct alternate forms because of the large number of variables involved.

EXAMPLE

> If the task included multiplying three-digit numbers by three-digit numbers, there would be almost one million possible multiplication problems. It would be impractical to construct enough alternate forms of the JPM to include all of these.

In the above example, a predetermined quantity of randomly selected numbers could be used for the JPM. In that way, no one would know, until the testing began, which numbers would be selected.

This example raises a critical question: Why not initially select three or four problems such as:

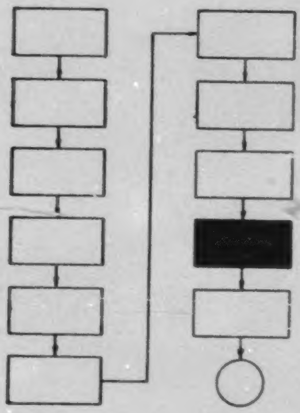
987 x 639 = ?　　542 x 861 = ?

609 x 713 = ?　　484 x 275 = ?

and let these be the JPM? The reason is that one of the important uses of JPMs is to serve as the basis for the training program. This means the training program will be designed to teach people to pass the JPM. If the four problems listed above were the only ones included in the JPM, they might be the only ones taught. Even if other problems were taught, there would be no way to know they had been learned since they are not in the JPM.

2.9 Construct JPMs and Scoring Procedures

2.9.1 Document JPMs



Once you have completed the steps outlined in Sections 2.1 through 2.8, construction of your JPM is largely complete. All that remains is documenting your decisions and developing a procedure for scoring the JPM.

Documenting JPMs is quite similar to documenting tasks (see Figure I.10, Block I.1). Like tasks, JPMs have conditions, cues, and standards. JPMs also have procedural steps that often are similar to elements. The same form used to document tasks can be used to document JPMs. Figure I.20 is an example of a JPM written on such a form. By attaching each JPM to the corresponding task documentation, a complete package of information is made available upon which the training program can be based.

2.9.2 Develop Scoring Procedures

There are two basic means of obtaining a record of each job incumbents performance. The approach required depends upon the nature

JOB DATA WORKSHEET

JOB TITLE Medical Corpsman (91A10) DOS ______ PAGE NO. 1

DUTY/CODE Applying first aid (A) LEVEL ______ DATE 5/2/75

ITEM CODE	TASK, ELEMENTS, J.P.M.	CONDITIONS	INITIATING CUES	STANDARDS	NOTES
A-001	JPM: Perform mouth-to-mouth resuscitation.	Dummy used as casualty. Casualty (dummy) will be lying on the ground.	Test administrator states: "At this station, the casualty next to you is unconscious. You find a weak pulse. He has stopped breathing. Complete your estimate and then take immediate action."	The trainee must successfully complete each step in sequence.	

Step 1: POSITION CASUALTY.
Carefully place the casualty on his back.

Step 2: DETERMINE IF THERE IS A PULSE.
Check pulse in appropriate place.

Step 3: CLEAR AIRWAY.
Turn the casualty's head to one side and run your fingers behind the lower teeth and over the back of the tongue in order to remove any vomitus, mucus, or debris from the mouth of the casualty.

Step 4: TILT HEAD.
A. --Turn casualty's head to face-up position.
B. --Tilt the head back so that the front of the neck is stretched with the chin in a "jutting-out" position.

Step 5: LIFT JAW.
Place your thumb into the casualty's mouth and lift his jaw forward.

Step 6: PINCH NOSE SHUT.
Pinch shut the nose, in order to prevent air leakage.

FIGURE I.20: Example of JPM Documentation

JOB DATA WORKSHEET

JOB TITLE 91A10 DOS PAGE NO. 2

DUTY/CODE A LEVEL DATE 5/2/75

ITEM CODE	TASK, ELEMENTS, J.P.M.	CONDITIONS	INITIATING CUES	STANDARDS	NOTES
			Tester will ask, "what steps do you take now to breathe for the casualty?"		
Step 7: A. B. C.	SEAL MOUTH/BLOW FORCEFULLY (EXPLAIN AND SIMULATE). --Take a deep breath. --Seal mouth around the casualty's mouth. --Blow forcefully into casualty's mouth until his chest rises.				
			Tester will state, "The casualty's chest is rising."		
Step 8: A. B.	EXHALATION (SIMULATE). When chest rises-- --Stop blowing and remove your mouth. --Take another breath while listening for the casualty's exhalation.				
Step 9:	BREATHE UNTIL RELIEVED (SIMULATE). When the exhalation is finished, blow in the next breath. On the first several breaths blow rapidly and strong. Then blow in a normal, even cadence (12-20 times per minute).				
			Tester states, "You are now relieved by a medic."		END OF TEST

FIGURE I.20: (Continued)

of the task to be tested. From a scoring point of view, the best performance measure is one which permits the job holder to produce the record of his tested performance. Such records would include the holes in a practice target, the correct assembly of a piece of equipment, the elimination of a known fault in a system, and proper procedures on a teletype. All these performances leave evidence or records that can be scored by evaluators in an objective fashion. These also have high physical fidelity with the job tasks. For instance, hits on a practice target are a record of performance on a task with only slightly less fidelity than the hits on an enemy position.

Some tasks will not provide a record of performance. Knowledgeable supervisors or SMEs will be required to either observe the job incumbent's performance or to inspect a produced product in order to obtain the record of performance.

Other tasks involve equipment and may require the job incumbent to perform a series of procedural steps. An observer is required to record performances on each essential step. Some tasks will require the incumbent to produce a product. For many of these products, the record of performance can be obtained only from an inspection of the product by a qualified supervisor.

Developing scoring procedures involves determining the most appropriate procedures for recording the adequacy of the product, process, or both. Following are some guidelines in the form of discussions of techniques for scoring products and processes, various types of rating scales, and various types of common scoring errors and reasons for each. Based on these guidelines, you should develop and document the scoring procedure for each JPM.

2.9.2.1 Product Rating Method

Since the product, unlike the performance, is usually a tangible object, product rating is more reliable than process rating. The example in Figure I.21 shows a product scale for rating ability to fly a simulator (link trainer). The pilots being tested are required to fly a pattern that corresponds with the pattern shown at A. By comparing the product with the standard provided in the scale, the rater can measure the product. If followed carefully, this procedure can eliminate nearly all rating errors.

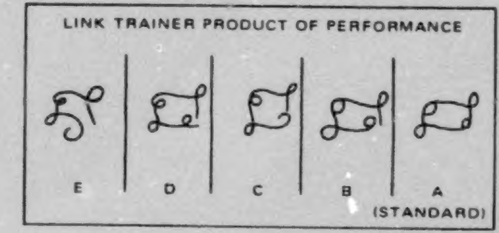


FIGURE I.21: Example of Product Scale for Rating Proficiency in Simulator These are tracings from a link trainer recording device. The ones to the left of A are inadequate.

In developing a scoring procedure for a product, identify as accurately and specifically as possible the scorable characteristics. Identify specific characteristics that distinguish a satisfactory product from an unsatisfactory one. If the product is to be measured by some kind of instrument, identify the characteristics to be measured and provide the scorer with the specific instructions for making the measurement. On the basis of the standard, decide what is a passing score. If the standard does not provide clear guidance, revise it until it does.

2.9.2.2 Process Rating Methods

A good scoring procedure for process measurement will provide the scorer with explicit directions on what the examinee should be doing at each stage in the JPM. A detailed step-by-step description of the process by which the JPM is performed will provide a basis for scoring. The various actions required can be written in checklist form.

Regardless of whether the output is a product or a process, some form of rating scale is generally used to rate performance. Following is a discussion of some of these scales.

2.9.2.3 Checklists

A checklist is useful for recording the performance of a set procedure. The example in Figure I.22 shows a portion of a checklist for rating instrument flying proficiency. In using the checklist, the observer indicates whether the completion of each step was satisfactory or unsatisfactory. Breaking a performance into several observable elements greatly reduces error.

-CHECKLIST-

INSTRUCTIONS: If the performance is satisfactory place a + sign in the space provided. If the performance is unsatisfactory, place a - sign in the space.

1. Maintains constant heading . . . . (within 5° of course) ☐
2. Maintains constant altitude. . . . (within 50 feet) ☐
3. Can make a timed turn (gyros . . . caged) (within 10° of new heading) ☐
4. Can make a steep turn (within. . . 50 feet of altitude) ☐

FIGURE I.22: Example of Checklist for Rating Proficiency in Instrument Flying

Reliability is usually high in checklist rating because of the nature of the decisions required and the specificity of the items listed. Generally speaking, the more specific the items on the checklist and the longer the list, the higher the reliability. A general rating category is virtually worthless.

EXAMPLES

> "Follows pre-flight safety procedure," is too general; but "makes the visual inspection of aircraft," "uses pre-flight checklist," and "starts engine after starting signal" all provide a much better opportunity to make reliable ratings of performance.

2.9.2.4 Rating Scales

1. Numerical scales. A numerical scale divides performance into a fixed number of points. The number of points on the scale depends primarily on the ability of observers to differentiate. Most people are able to make at least five differentiations; but few trained observers can reliably make more than nine differentiations. As a result, most numerical scales contain five to nine points.

2. Description scales. The description scale uses phrases to indicate levels of ability. The example in Figure I.23 is a descriptive scale for rating pilot landing, with five levels of ability described. The degrees of performance can be varied to suit the occasion.

INSTRUCTIONS: Place a check mark in the scale above the word that most accurately describes the pilot being rated.

ACCEPTABLE	FAIR	GOOD	EXCELLENT	SUPERIOR

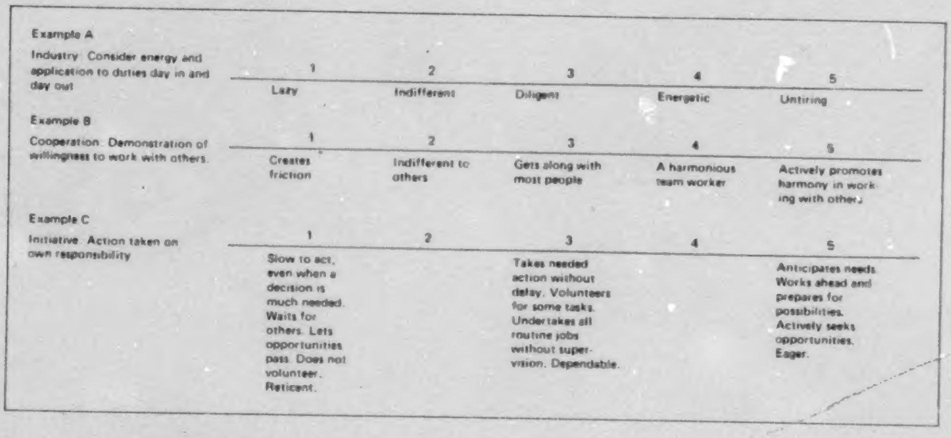
FIGURE I.23: Example of Descriptive Scale for Rating Pilot Take-Off

For example, suppose an operations officer wants to evaluate the flying ability of his pilots. He feels that all his pilots satisfy performance requirements, but he wants to know to what degree each is better than satisfactory. By using a descriptive scale, the operations officer gives his observers a frame of reference. Here the lowest rating possible is labeled "acceptable."

The major disadvantage in using descriptive scales is a semantic one. An "excellent pilot" does not mean the same thing to all observers. Another disadvantage is that it is hard to select phrases which describe degrees of performance that are equally spaced. When the scale shown in the example is used, most people feel that there is less distance between "excellent" and "superior," than between "fair" and "good."

3. Graphic scales. The graphic scale is a combination of numerical and descriptive scales. Besides a numerical scale, various adjectives or phrases are set below a continuous horizontal line. (The line represents the range of the ability or trait being measured.) In using the graphic scale, the observer must consider not only the numerical range of the scale but the phrases that describe the various positions on the scale.

Three typical forms of the graphic scale are shown in Figure I.24. In Example A, the observer is given instructions for judging the trait of "industry." He is told to mark the scale after considering "energy and application to duties, day in and day out." These instructions help reduce errors and improve objectivity and reliability. They also encourage observers to consider the same things about each person.



	1	2	3	4	5
Example A Industry. Consider energy and application to duties day in and day out	Lazy	Indifferent	Diligent	Energetic	Untiring
Example B Cooperation. Demonstration of willingness to work with others.	Creates friction	Indifferent to others	Gets along with most people	A harmonious team worker	Actively promotes harmony in working with others
Example C Initiative. Action taken on own responsibility	Slow to act, even when a decision is much needed. Waits for others. Lets opportunities pass. Does not volunteer. Reticent.		Takes needed action without delay. Volunteers for some tasks. Undertakes all routine jobs without supervision. Dependable.		Anticipates needs. Works ahead and prepares for possibilities. Actively seeks opportunities. Eager.

FIGURE I.24: Example of Typical Forms of a Graphic Scale

Example B shows a graphic scale in which certain types of behavior are described for each point on the scale. With most scales, the observer must not only observe, he must also evaluate his observation to form a rating. People can observe more accurately than they can evaluate what they have observed. Whenever ratings can be based on observations alone, reliability is greatly improved. In Example B (Figure I.24), the observer is required only to record, not evaluate, the actions of the person being rated. Hence, this type of graphic scale incorporates much objectivity. In preparing this type of scale, make sure that the behavior described for each point is actually an improvement over the point just below it, and distances between the points should appear to the observer to be about equal.

The scale in Example C is similar to that in B, except descriptive phrases are not provided for all points. Many times observers feel that the rating should fall somewhere between two points, such a rating is possible with this form of the graphic scale. The fuller descriptions of Example C increase the likelihood that observed behavior can be pinpointed on the scale. Generally, the more detailed descriptions should contribute to better rating results.

2.9.2.5 Establishing cut-off scores

Many tests are designed to assess proficiency on a given task. Since it is often impractical to insist on perfect test scores, it may be necessary to decide upon a cut-off point (a score below which is considered failing or "no-go"). The more complex the skills assessed by the test and the more varied the type of performance or product, the greater is the danger of misclassification (designating a "no-go" as a "go," or vice versa).

There are no fixed rules or formulas for establishing the cut-off point, but a number of factors can be considered:

1. Immediate manpower needs. If manpower needs are very high, it may be necessary to lower cut-off levels especially if errors are less critical than no performance at all.
2. Upper feasible score for an established "go." A target may be so placed that even the best marksman may score only

50 percent hits. If a 70 percent cut-off is set here, no one will pass at all.

3. Consequences of inadequate performance, or task delay tolerance. The greater the risk of substantial damage to persons or property, the higher the cut-off score should be.

Establishing cut-off points is a complex matter, and decisions should be reached on this matter only after careful consideration of the general acceptable performance standards for the task(s) and the consequences. A good guideline is that if the consequences of passing one incompetent man are severe, the cut-off point should be set high.

In general, cut-offs are useful when:

1. Absolute mastery of the task is not expected but a suitable level of performance can be specified.
2. Absolute mastery is possible but factors other than competence affect the score (such as careless errors, measurement errors, etc.).

2.9.2.6 Measurement Errors

Performance measures must lead to decisions that are consistent and unbiased. Consistency implies that decisions made about an individual's ability to do his job will not vary over a period of time (assuming that the individual remains the same) and that different judges using the same performance measure will make the same decisions in any given testing situation. An unbiased performance measure is one that ensures that decisions are based only on the task in question and are not influenced by other unexpected or unaccountable factors.

Some of the factors that lead to inconsistency and bias in performance measures are:

1. The lack of clear standards for judging the particular product or process
2. Poorly written test items and/or testing directions
3. Untrained judges who may be biased or who do not understand the performance measure
4. The testing environment
5. Malfunctions of special tools or equipment used in the test
6. Individual day-to-day differences in performance

Rating errors can be classified into three broad groups:

1. Errors of standards
2. Errors of halo
3. Errors of logic

1. Errors of standard. Some observers tend to rate performers too high or too low because of differences in their standards. Standards using physical measurements--inches, centimeters, ounces, grams--are fixed values. However, standards involving judgment and abstract comparison may be as many and varied as the observers themselves.

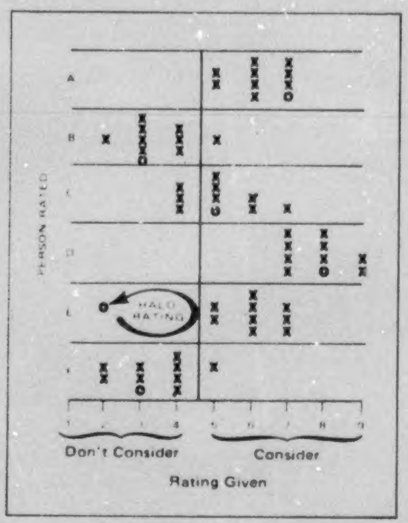
EXAMPLE

> Fried eggs are overcooked if there is a noticeable "lacing or bubbling," around the perimeter, which is a darker color than the remainder of the egg white.
>
> Based on this criteria, two observers might have a great deal of difficulty agreeing on whether a particular egg was overcooked.

2. Error of halo. An observer sometimes allows his rating of performance to be influenced by his general impression of the person. Such an impression is usually formed on the basis of observations or knowledge extraneous to the rating. If allowed to influence judgment, the impression will result in a shift of the rating called an error of halo. If the rater is favorably impressed, the shift is toward the high end of the scale. Halo error can be either favorable or unfavorable, and it affects only certain persons rated. Error of halo may be suspected in many situations; but it can be positively identified only when many competent and experienced observers rate a number of persons under identical conditions.

EXAMPLE

Jones and nine other observers rated six persons on teaching ability. The criterion for consideration for a promotion was a rating of 5 or higher by all ten raters. The ratings might have been as illustrated.



> (Jones' rating is indicated by O, other raters by X.) All ten observers agreed reasonably well on the teaching ability of five of the six persons rated. All but Jones agreed on the teaching ability of the sixth (E). For person E, 8 of the 9 judges rated him 5 or above--only Jones rated him lower. Apparently, Jones allowed some unfavorable impression regarding E to influence his rating unduly; he made an error of halo. If two promotional slots were available, teacher D would clearly be considered; but, remembering Jones' halo rating, there would be some difficulty in deciding whether teacher A or E should be considered for the second slot.

3. Error of logic. An error of logic may occur when two or more traits are being rated. It is present if an observer tends to give similar ratings to traits which do not necessarily go together. For example, some observers may think that an industrious person is also efficient. Industrious persons may often be efficient, but not necessarily so.

"Error of logic" means that the traits are related only in the mind of the person making the error. The relationship may not appear to be logical to someone else. As a matter of fact, the person who exhibits an error of this sort is probably not really aware of it.

EXAMPLE

> In the illustration of Error of Logic that follows, six observers (A, B, C, D, E, and F) rated a certain person on four traits (industry, promptness, efficiency, and courtesy) on a scale of 1 to 9. In three of the traits, the six observers agree reasonably well, however, E gave a much higher rating on efficiency than did the other observers. And E assigned the same rating to both efficiency and industry. It appears that E thinks industry and

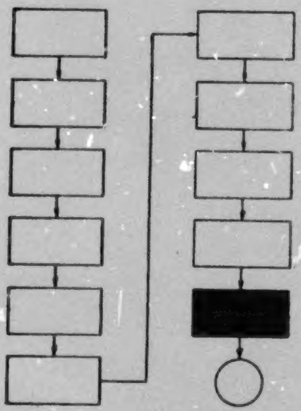
efficiency are much the same--an error of logic. There may be many reasons for this error: E may not have observed the performer's efficiency enough, or he may not distinguish between efficiency and industry. In any event, in rating efficiency, E and the other observers have not rated the same thing. In effect, E rated industry twice.

Logical Error

	1	2	3	4	5	6	7	8	9
INDUSTRY							B,F	A,D,E	C
PROMPTNESS					A,C	D,B,E	F		
EFFICIENCY			A,B,D	C,F				E	
COURTESY		C,D,E	A,B,F						

RATING GIVEN

2.10 Validate and Revise



A validated JPM is one that has been tested and found to have high predictive validity or, where constraints preclude testing, has been verified as having high fidelity. Many JPMs can be validated on the job; e.g., mechanics' tasks, cooks' tasks, pilots' tasks. These jobs are performed regularly under a broad spectrum of real-world conditions. In such cases, validation is similar to job analysis. The validator observes the performer and thereby checks his checklist or measure. The number of incumbents needed for validation is very small for unitary tasks, higher for multiple tasks.

There are also jobs that are performed rarely or only in combat where validation may be hazardous both to the job performer and the validator. In these cases, JPMs are "verified" rather than validated. Experienced performers should add any missing steps or conditions, and delete any superfluous ones, and verify the standards.

A third type of validation is for new job tasks: ones that have never been performed, like many space mission or new weapons tasks. This requires a combination of validation of the parts that are similar to parts of tasks that have been performed before, and verification with engineers and manufacturers of hardware. These should be considered tentative and subject to revision when the job is performed.

2.10.1 Prepare for the Tryout

Follow the rules below.

1. Conduct the draft tryout:
    - Draft general instructions for the JPM.
    - Ensure, through use of SMEs and job incumbents, that the items are congruent with the corresponding job tasks.
    - Complete all resource arrangements for giving the draft JPM.
    - Train examiners and scorers. At least two (preferably three) scorers should be used.
    - Select examinees. Select several who are typical of the incumbents in the job.
2. Prepare forms for recording the information discussed in item 3.

3. Select observers. Observers will watch the administration of the JPM and record information that can be used to correct deficiencies in the items or the assessment procedures themselves. (They may be used as scorers as well as observers to test reliability of the raters.)

2.10.2 Conduct the Tryout

As a rule, conduct the tryout as if it were "for real" except for the following procedure. Conduct the tryout in steps. Measure five job holders and revise the JPM to correct difficulties found. Then, measure the next five job holders; they will be a check on the success of the revisions. This procedure may uncover further difficulties, and the success (or lack of success) of your revisions will be demonstrated. Continue the process of measuring and revision until all deficiencies are corrected.

Following are some guidelines for obtaining information concerning problems with the testing situation itself.

1. To see if general and specific instructions to the examinee are clearly understood, ask the trainee to repeat them in his own words. Note any significant deviations.
2. Record any questions asked by the examinee. From these, written instructions can be prepared to answer frequently asked questions.
3. Record any shortage of supplies or breakdown of equipment.
4. Note any ways in which the layout of equipment can be improved without impairing the validity of the performance measure.

5. Note any accidental injury to the examinee or damage to equipment.
6. Note the time required and any problems experienced in re-establishing a test station for the next examinee.
7. If the JPM is given in a series of stations, observe any problems experienced in maintaining a smooth flow of examinees from test station to test station (i.e., workbench to paint booth).
8. Note any testing conditions which may invalidate the results.
9. When examinees make errors, question them. Note if their wrong answers indicate a misunderstanding of the item.
10. Note any actions of the examiner which might give away the correct answers or confuse the examinee.

Report this information in sufficient detail to provide a basis for correcting any deficiencies.

The purpose of the tryout is to make the JPM as reliable as possible by eliminating as many sources of unreliability as possible. It is not necessary to try out each item on the performance measure to the same extent. As soon as an item proves unsatisfactory when given to each of at least 10 examinees, it should be replaced with a new item.

Remember, the validator must verify JPM conditions, cues, and standards while he is validating the JPM task.

When the tryout is finished, you will have a corresponding performance measure for each task on the list of tasks selected for instruction. These measures are not the objectives of the instruction, they are intended as an evaluative device for quality control of the instruction.

2.10.3 Revise Items as Required

The tryout will point out any problems with your JPMs. What is wrong usually can be determined from the inputs you get from the administrators. After you correct the problems, you will have to try out the JPMs again. This cycle must be repeated until all JPMs are validated or verified.

3.0 OUTPUTS

The outputs of this block should consist of:

3.1 Products

1. A validated or verified JPM for each task selected for training. For each JPM, this includes the required test performance, and the test conditions, cues, and standards. (See Figure I.25.)
2. Administrative instructions for the JPMs. (See Figure I.26.)

3.2 Other Documentation

1. The rationale for your decisions where constraints have necessitated serious trade-offs.
2. A summary statement of implementation and results of verification/validation.

JOB DATA WORKSHEET

JOB TITLE OH-58 Helicopter Repairman

DOS Helicopter Repairman

PAGE NO. 13

DUTY/CODE (C)

LEVEL E-1 through E-6

DATE 5/5/75

ITEM CODE	TASK, ELEMENTS, J.P.M.	CONDITIONS	INITIATING CUES	STANDARDS	NOTES
C-100-003	Install tail boom	In a maintenance work area, using an OH-58 airframe training aid with tail boom uninstalled, appropriate technical manuals, general mechanics tool kit, DA Form 2408-13, and tail boom support stands.	Presented with an OH-58 helicopter airframe with the tail boom on support stands.	In accordance with Technical Manual 55-1520-228-20. Make required entries in DA Form 2408-13. Observe safety precautions defined in technical manual 55-1520-228-20.	OH-58 helicopter airframe training aid or actual OH-58 helicopter may be used.
	ELEMENTS:				
C-100-004	Align tail boom attaching point with tail boom attaching bolts.	Assistance from instructor or other students required to manipulate tail boom.	Same as C-100-3.	Same as C-100-3.	

FIGURE I.25: Example of List of Validated JPMs for Each Task

*PERFORMANCE CHECKLIST

JOB TITLE OH-58 Helicopter Repairman DOS Helicopter Repairman

DUTY/CODE (C) LEVEL E-1 through E-6

TASK-ELEMENT	COMPLIANCE WITH TM-55-1520-228-20 PROCEDURES			COMPLIANCE WITH TM-55-1520-228-20 SAFETY STANDARDS			ENTRY REQUIRED ON DA FORM 2408-23			OTHER		
	YES	NO	EXPLANATION	YES	NO	EXPLANATION	YES	NO	EXPLANATION	YES	NO	EXPLANATION
Install tail boom												
1. Align tail boom attaching point with tail boom attaching bolts												
2. Connect tail boom with four tail boom attaching bolts.												Torque four bolts to 375 to 415 inch-pounds
3. Repaint torque stripes												
4. Install inspection plate												Punched surface of plate faces outward

FIGURE I.26: Example of Administrative Instructions

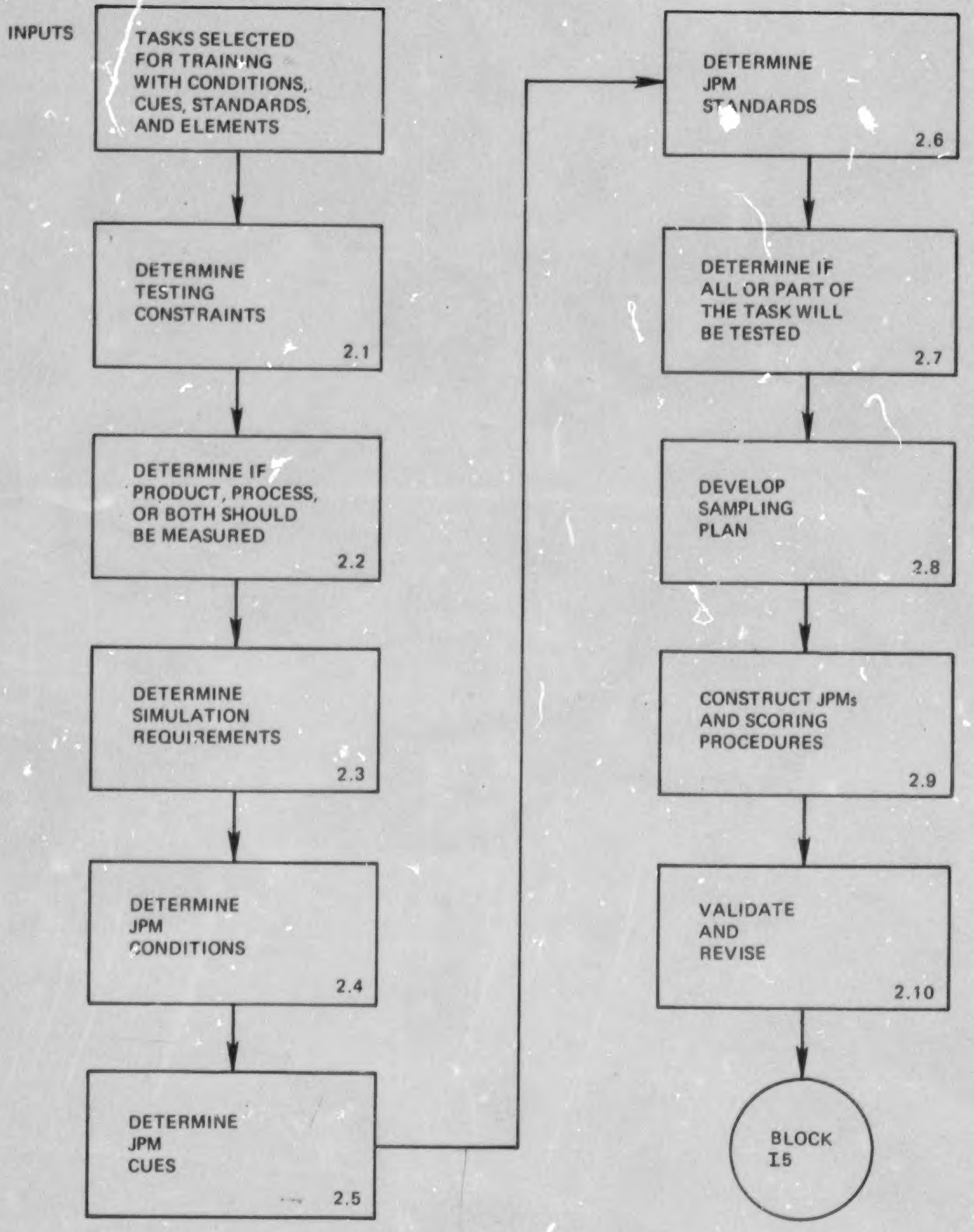
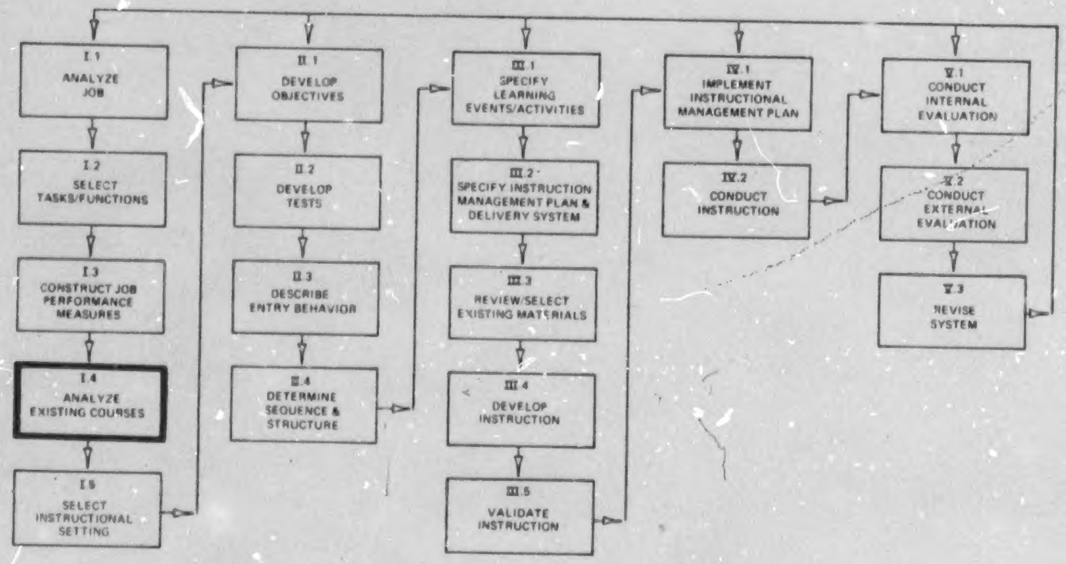

INPUTS
TASKS SELECTED FOR TRAINING WITH CONDITIONS, CUES, STANDARDS, AND ELEMENTS
DETERMINE TESTING CONSTRAINTS
2.1
DETERMINE IF PRODUCT, PROCESS, OR BOTH SHOULD BE MEASURED
2.2
DETERMINE SIMULATION REQUIREMENTS
2.3
DETERMINE JPM CONDITIONS
2.4
DETERMINE JPM CUES
2.5
DETERMINE JPM STANDARDS
2.6
DETERMINE IF ALL OR PART OF THE TASK WILL BE TESTED
2.7
DEVELOP SAMPLING PLAN
2.8
CONSTRUCT JPMs AND SCORING PROCEDURES
2.9
VALIDATE AND REVISE
2.10
BLOCK I5

FIGURE I.18: Flowchart of Block I.3: CONSTRUCT JOB PERFORMANCE MEASURES

BLOCK I.4: ANALYZE EXISTING COURSES


I.1 ANALYZE JOB
I.2 SELECT TASKS/FUNCTIONS
I.3 CONSTRUCT JOB PERFORMANCE MEASURES
I.4 ANALYZE EXISTING COURSES
I.5 SELECT INSTRUCTIONAL SETTING
II.1 DEVELOP OBJECTIVES
II.2 DEVELOP TESTS
II.3 DESCRIBE ENTRY BEHAVIOR
II.4 DETERMINE SEQUENCE & STRUCTURE
III.1 SPECIFY LEARNING EVENTS/ACTIVITIES
III.2 SPECIFY INSTRUCTION MANAGEMENT PLAN & DELIVERY SYSTEM
III.3 REVIEW/SELECT EXISTING MATERIALS
III.4 DEVELOP INSTRUCTION
III.5 VALIDATE INSTRUCTION
IV.1 IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN
IV.2 CONDUCT INSTRUCTION
V.1 CONDUCT INTERNAL EVALUATION
V.2 CONDUCT EXTERNAL EVALUATION
V.3 REVISE SYSTEM

OVERVIEW

Considerable time and resources can be saved if an existing course can be found that will meet the training need. Whether the existing course will meet the training need depends on the acceptability of the front end analysis upon which the course was based and on the acceptability of the validation documentation. The procedure is one of reviewing the documentation of how the course was developed and validated, and making a determination as to whether the methods used are likely to have produced a course that will meet the training needs.

ANALYZE EXISTING COURSE

1.0 Introduction

This block often is the logical beginning point in the ISD process. As was stated in Block I.1, the reason for placing this block fourth is that, to understand the procedures outlined in this block, you must have a thorough understanding of what takes place in the first three blocks.

The ISD process is put into motion by a management decision that a training program must be provided for a particular Defense Occupational Specialty (DOS). If this is a new DOS (that is, no one does the job now), or if no training program for this DOS is now in existence, begin in Block I.1. However, if some one does the job now and one or more training courses exist, begin in this block. Here you will determine if one of the existing courses will meet some or all of your requirements.

Remember that at this point you have not conducted a job analysis, selected tasks for training, or developed Job Performance Measures (JPMs). You started out by analyzing existing courses to see if you could avoid all or part of the time and cost not only of carrying out the above steps but of developing and validating the instructional materials.

One of the main purposes of the interservice ISD program is to increase the cooperative development and use of training. This block specifically requires careful search for and analysis of existing needs and courses to ensure that these purposes are met.

Except in highly technical fields and in areas where hardware changes frequently, much of what will be done using ISD will be the revision and improvement of courses that have already been used for some time. It is important to be aware of these courses as early in the ISD process as possible for three reasons:

1. To avoid duplication of effort by utilizing existing courses without modifications, or by making only minor revisions. Such courses may be offered by another service or another branch of your service.
2. To permit a possible decision, for courses with small annual enrollment, to utilize an existing less-than-perfect course as a temporary expediency.
3. To avoid duplication of effort in analyzing job requirements and in developing instructional materials. If any part of this work has already been done to your satisfaction, you will not have to do it again.

When analyzing existing courses, your primary concern is whether a course will teach individuals to perform the tasks that are required to perform on the job. At this point you have no way of knowing what these tasks are. The first requirement, then, of an existing course is the availability of the job analysis data upon which the course was based. If this job analysis data is not available, there is no practical way to know whether or not the course meets the requirements, since these requirements have not been documented.

EXAMPLE

> If you have been given the assignment of providing an adequate training program for Decontamination Specialists, examining the actual instructional materials for an existing course with the same title will not permit you to pass judgment on whether it will meet your training needs. Even if you know this existing course supposedly trains people to perform certain listed tasks, you cannot be sure these are the tasks you wish to train. Before you can judge whether the tasks covered in the existing course are likely to be the same tasks you need to train, you must know how, when, and where the task list was prepared.

The above example points out the need not only for examination of the job analysis data but for examination of the criteria by which tasks were selected for training. Also, since the terminal learning objectives for a course are derived from the Job Performance Measures (JPMs), you will need to analyze the JPMs to determine whether the existing course is based on measures that are realistic predictors of job performance. These three major steps--job analysis, selection of tasks for training, and development of JPMs--are usually referred to as Front End Analysis. Front End Analysis has to have been accomplished by acceptable ISD procedures before you can pass judgment on whether the existing course can be used. For this reason, having at hand the actual instructional materials for an existing course is not initially as important as having at hand the documentation of how the Front End Analysis was accomplished.

In addition to the documentation of the Front End Analysis, you will need to know how the existing course was validated; that is, how it was determined that students who take the course actually learn what they are supposed to learn. This validation data, however, is not as essential as the Front End Analysis data because it is easier to validate an existing course than it is to redesign a course that is based on an unacceptable Front End Analysis.

For the cases in which Front End Analysis shows that the procedure used in constructing the course produce basically the same results as would the ISD procedures (described in Blocks I.1, I.2, and I.3), you can accept that the selected tasks correspond to those you consider important. And if the validation documentation shows that individuals taking the course do, in fact, learn what they are supposed to learn, you can accept that basically the course is acceptable.

You may question the idea of discarding a course just because the Front End Analysis is non-existant or is unacceptable. If some of the course materials still could be useful, you may be correct. Later in the model, in Block III.3: REVIEW/SELECT EXISTING MATERIALS, all or portions of an existing course may be selected. However, before you can determine how to train, you must determine what to train. In this block, your primary concern should be the basis upon which the course was built rather than the actual course content.

It would be unrealistic to expect an existing course to serve perfectly. For instance, language barriers created by specialized terminology will make even your attempt to locate and interpret the Front End Analysis data for an existing course more difficult. Each of the services has developed a functional language of its own which can be most confusing to outsiders. Is it a "deck" or a "floor," a "head" or a "latrine?" Even usage of similar terms varies greatly. The Army's TRADOC Reg. 350-100-1 refers to the "Systems Engineering of Training," while the Navy's CNET Instr.1550.0 refers to the "Instructional Systems Development of Training." We would ask the Air Force if a course had been developed according to ISD or by the procedures in AFP 50-58, but we would ask the Army if the course had been systems engineered. Even if you find a course acceptable, you must expect to make minor changes to translate specialized language to fit your service and command.

The output of this block will include your judgment of:

1. Whether the Front End Analysis and validation of existing courses is acceptable to your command.
2. If part of the Front End Analysis or the course validation is not acceptable, what part is acceptable.
3. Whether any part of the work that hjs already been done is potentially usable and, if so, which parts.

The steps in analyzing existing courses are shown in Figure I.27, the fold-out page at the end of this block.

2.0 Procedure

The first three steps in the ISD process require much effort to collect and analyze documents, prepare job descriptions, and make a variety of highly important decisions. If these three steps are done well, training provided will coincide with the tasks performed on the job. If they are not done well, unnecessary training or lack of training for important job requirements will result.

In this block, you will analyze the documentation of the basis for development of existing courses to determine if a course trains what needs to be trained. There are two kinds of courses:

1. Those that have been properly developed by ISD (that is, properly systems engineered), and
2. Those that have not.

Properly prepared ISD courses will have available for analysis the documentation of how the courses were developed. They will have been developed only after proper Front End Analysis. They will be based on competent job analyses, will have training priorities clearly specified, and will have realistic performance measures developed. No course can be said to be properly developed unless these three conditions are met, regardless of the sophistication of the training equipment or methods.

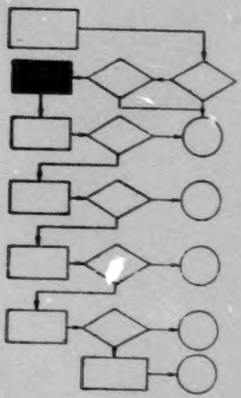
If there are existing courses, in any of the services, that have been developed by ISD, or if there are even parts of these courses that can be used, much time and money can be saved. In the ideal situation, you can use an existing course with only minor if any changes. And even as a minimum, important parts of the course can be acquired for use, thus saving the cost of duplicating the training materials and procedures. Further, meetings can sometimes be held with directors and instructors of the existing courses to gain the benefits of their training and experience.

A considerable amount of judgment will be required in making decisions about the appropriateness of materials and courses developed external to the command in which they are needed. But also guard against the natural tendency among professionals to assume that work elsewhere has not been done to the high standards established locally. This tendency is frequently referred to as the NIH (not invented here) attitude which means that unless we did it, it cannot be good.

But even locally there is much training that has been developed without having an adequate listing of the tasks most important for training. And since training sometimes e-x-p-a-n-d-s to fill the time available because of block scheduling, there is often much out-of-date and nice-to-know content in training courses. Also, many training courses are developed without being preceded by a highly refined and approved procedure for selecting tasks for training.

Remember, you should not reject good training just because it was developed elsewhere, and you should not accept available training just because it is available.

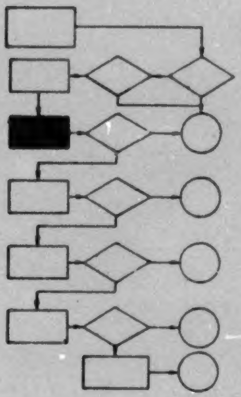
2.1 Secure Existing Courses and Their Development Documentation



Appendix B of Block I.1 lists sources of training courses and instructional materials, and sources of job analysis data. In addition to these directories and manuals, each service has a central training management command that is aware of all existing courses and new courses being developed. These sourses should be consulted, according to the procedures established by your command for that purpose, in order to determine if courses are planned or already exist which might satisfy your needs.

Remember, however, that the actual course materials are not the primary concern at this point. The detailed documentation of how the course was developed is often much more difficult to obtain. You may have to trace the course back to the individual or group responsible for the original development. Even if the course development documentation has not been printed, it may be available in the workbooks and notes of those who developed it.

2.2 Analyze Job Analysis Documentation



If you determine that the existing course was not based on a job analysis or that job analysis documentation is not available you will have to go back to Block I.1 and analyze the job. If the course has a documented job analysis, you must determine if it is acceptable. Some criteria for making this determination are as follows:

1. If the analysis was not done within the last five years, the data may be obsolete. However, the nature of the job is a factor here, some jobs change very little over time.
2. If there have been substantial equipment, doctrine, manpower, or personnel system deletions or additions since the analysis was done, you probably will have to do it over. But, at least, what is already done can be a starting point for the new job analysis.
3. The sources of the job data is critical. It is possible, for example, that the so-called job analysis was conducted by talking to people who once held the job, or by copying from course outlines and lesson plans. This, of course, is not an acceptable job analysis.
4. If the analysis was done according to procedures in Block I.1 or according to procedures similar to those, you can have considerable confidence in the accuracy of the analysis.

5. Even if the job analysis was expertly done, it still might not be acceptable. It is essential that the conditions and requirements under which the analysis was conducted be close enough to your situation to allow you to generalize from one to the other.

EXAMPLE

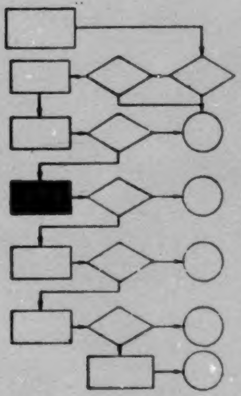
> If the job analysis for a specialized equipment repairman was conducted on aircraft carriers in the South Pacific, and if the job with which you are concerned is repairing the same equipment, but on aircraft in Greenland, you may not be able to generalize from one situation to the other.

6. If the job analysis data are difficult to locate, and if the data are in only a semi-official form, you should place less confidence in the data. Usually, when a job analysis has been done properly, it will be documented and the documentation will be readily available.

Based on the above criteria, you should either:

1. Reject the existing job analysis, and go to Block I.1 and start at the beginning. However, be generous at this point; you should completely reject the existing analysis only if it is clearly unacceptable.
2. Tentatively accept the analysis. In this case, verify the task list, preferably by having it reviewed by a jury of experts. Based on this expert review, either accept the analysis and move on to Section 2.3 of this block, or reject the analysis and go back to Block I.1 and conduct a new job analysis.

2.3 Analyze Method Used to Select Tasks for Training



Once you have determined that the job analysis for the existing course is acceptable, you are ready to determine whether the tasks selected for training were selected according to the needs and priorities of your command. Since those who developed the existing course apparently did an acceptable job analysis--if not, you would not have accepted their work, and you now would be working in Block I.1 instead of in this section of this block--the chances are very good that they also did a good job of selecting tasks for training. Some guidelines for judging the acceptability of tasks selected for training are:

1. Did the developers of the existing course base their selection of tasks for training on basically the same criteria that are important to your command? A number of these criteria were discussed in Block I.2. It is not essential that the criteria used match exactly those you would have used. However, they should and probably will be reasonably close. If the course developers failed to use some criterion that you think is particularly important, you can survey a small group of perhaps 15-30 individuals who are familiar with the job, and have them rate the tasks according to this criterion. You may find that including this criterion would have made very little difference

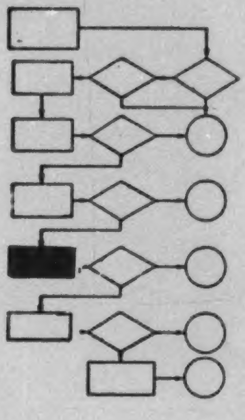
in which tasks were selected for training. If it appears to make a major difference, you may have to reject the existing course and go back to Block I.2 and select tasks for training.

2. Was the data upon which the selection of tasks was based obtained from basically the same geographical locations, skill levels, etc., that you would have used? If you think inputs from certain critical groups were not included, you can take a small sample survey of those groups and see if the additional data makes a significant difference. Again, it it does, you may have to reject the existing course and reselect the tasks for training.
3. Did those who developed the existing course base task selection on basically the same time, money, and other resource constraints that exist in your command? If not, they might have included tasks that you cannot afford to train, or they might have skipped tasks that must be trained. You will need management inputs to decide whether to train fewer tasks or more tasks than are included in the existing course.

If you decide to train more tasks, you still may be able to use the existing course. It might be practical and considerably less expensive to develop training for the added tasks and to use this new training along with the existing course.

If you cannot affort to train all the tasks included in the existing course, you may be able to delete the unwanted tasks from the course. It usually is considerably less costly to delete materials from a good course than start at the beginning and develop a new course.

2.4 Analyze Job Performance Measures



Once you have obtained concurrence in your command on the tasks selected for training, then find out if adequate job performance measures (JPMs) exist for the selected tasks. Block I.3 gave detailed information on how to develop good JPMs. If you apply this information, you should be able to recognize good JPMs developed by others. Careful review of a small sample of the JPMs usually will give an idea whether the JPMs are totally unacceptable or probably acceptable.

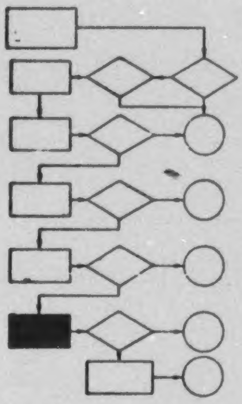
EXAMPLES

1. If the task is "adjust carburetor" and the JPM is "tell why well-adjusted carburetors are important," you know you have a lot of work to do. The match between "adjust" and "tell why" is too poor for the latter to be an acceptable JPM.
2. If the task is "destroy bridge," and the JPM is "given appropriate tools and equipment, destroy bridge, in the face of enemy fire, in 1 hour or less," you can reject the existing course and go to Block I.3 and start developing JPMs. While the above is a very good match, the JPM would be impossible to administer.

If the JPMs appear reasonably well-developed, you will want to review all of them. You may be able to make minor changes in some of the JPMs without seriously affecting the course. You may be able to use only the part of the course that is based on acceptable JPMs. At best, you will have acceptable JPMs and probably an acceptable course. At the worst, use the existing JPMs as a starting point for developing new ones.

2.5 Analyze Validation Documentation

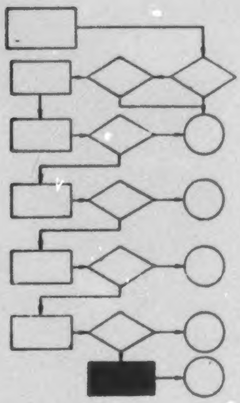
If you accept the JPMs for the existing course, this means you are in basic agreement that the course was designed to teach what you consider to be important. The only remaining question is whether the existing course does, in fact, teach what it was designed to teach. The chances are good that, since you have already determined that the course was based on an acceptable Front End Analysis, you also will find the course has been properly validated. Course validation is discussed in detail in Block III.5.



If the course has been properly validated, you will need to know something of the entry behaviors of students used to validate the course. If there is not reasonable certainty that their entry behaviors are like the entry behaviors of your students, you will have to revalidate the course for your students. Entry behavior is discussed in detail in Block II.3.

If the course has not been properly validated, or if the data are not available to make that decision, you will need to go to Block III.5 and go through the procedures necessary to determine if the course does what it was designed to do.

2.6 Make Required Revisions



Now that you have a course based on an acceptable Front End Analysis, and now that you know it teaches what it was designed to teach, your development effort is almost complete. As was mentioned earlier in this block, different services often use different words to mean the same thing--or the same word to mean different things. You probably will have to do some minor revision to make the course more understandable to your students. If you revalidated the course, some required changes may have been indicated in the validation process. You may have to change some of the examples used in the course to make the course more specific to your command. All of this should be a relatively minor effort compared to the considerable savings resulting from your using an acceptable existing course.

3.0 Outputs

The outputs of this block should consist of:

3.1 Products

1. Definition of the job. (See page 86 in Block I.1 for an example.)
2. If a suitable course is found, the complete course (see page 86 for an example) as it appears after any revisions.
3. If a suitable course is not found, any portions of the analyzed courses that are potentially useful in designing a new course. (See page 228 for an example.)

EXAMPLE

No suitable course was located for the job of OH-58 Helicopter Repairman. The course review was not unproductive, however. A number of potentially useful instructional materials were identified and are listed below. These will be reviewed thoroughly in Block III.3: ANALYZE EXISTING COURSES.

Potentially useful existing instructional materials for the job of OH-58 Helicopter Repairman.

1. One 10-minute 35 mm slide presentation demonstrating installation of the tail rotor gear box.
2. One set of transparencies demonstrating the maintenance operational check of the main transmission oil system.
3. Student handout describing procedures for troubleshooting the main transmission oil system.
4. Lecture script entitled "Components and Troubleshooting Procedures," explaining the relationships between the components of the main transmission oil system and the procedures for troubleshooting the system.
5. Student outline describing the components of the main transmission oil system.
6. Set of schematic 35 mm slides demonstrating procedures for inspecting the main transmission oil system for external evidence of damage.

3.2 Other Documentation

1. Statement of rationale for conducting analysis of existing courses.
2. Identification of courses analyzed.
3. Summary statement of major decisions in analyzing.
4. Summary statement of any revisions made to existing course, and reasons for the revisions.

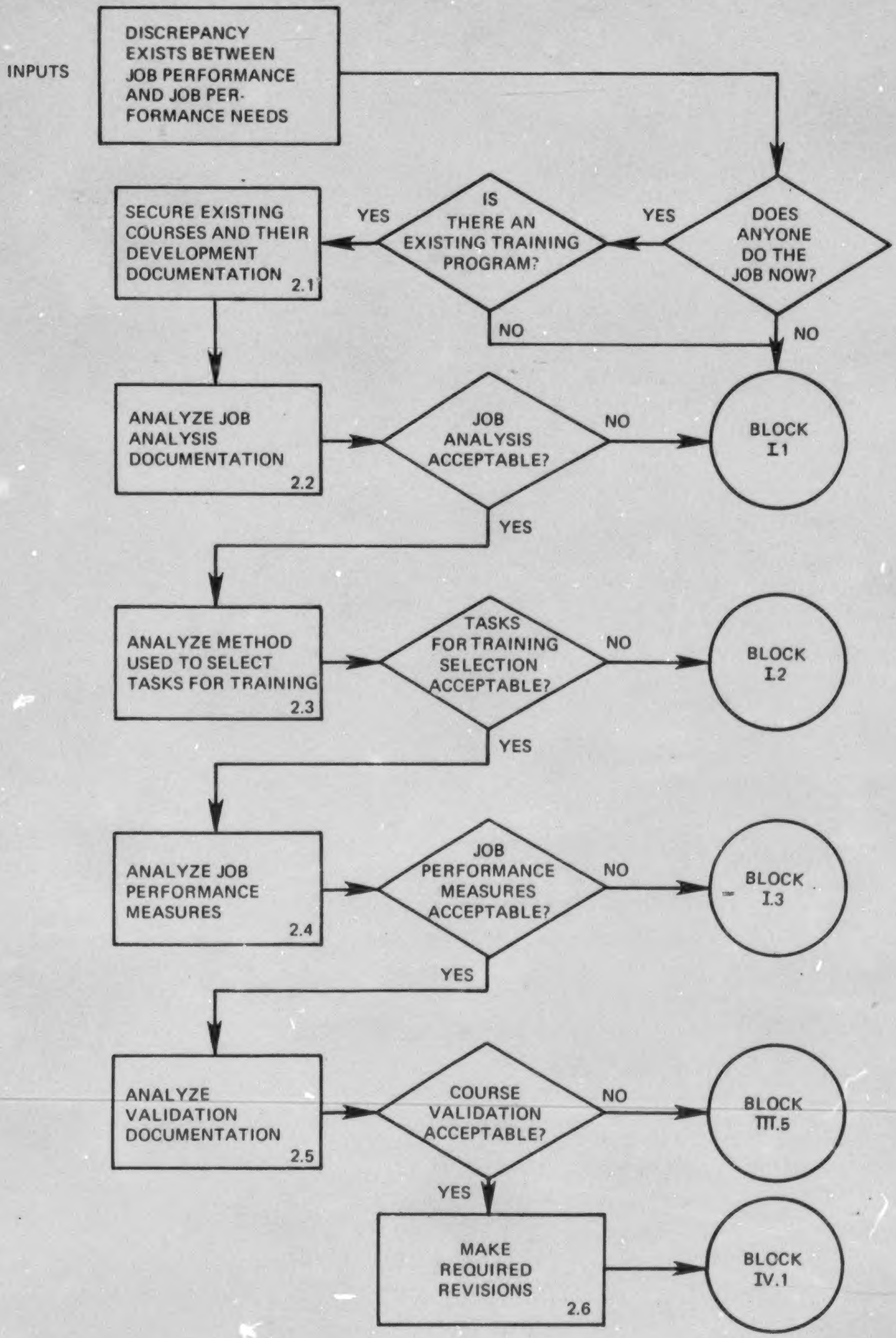
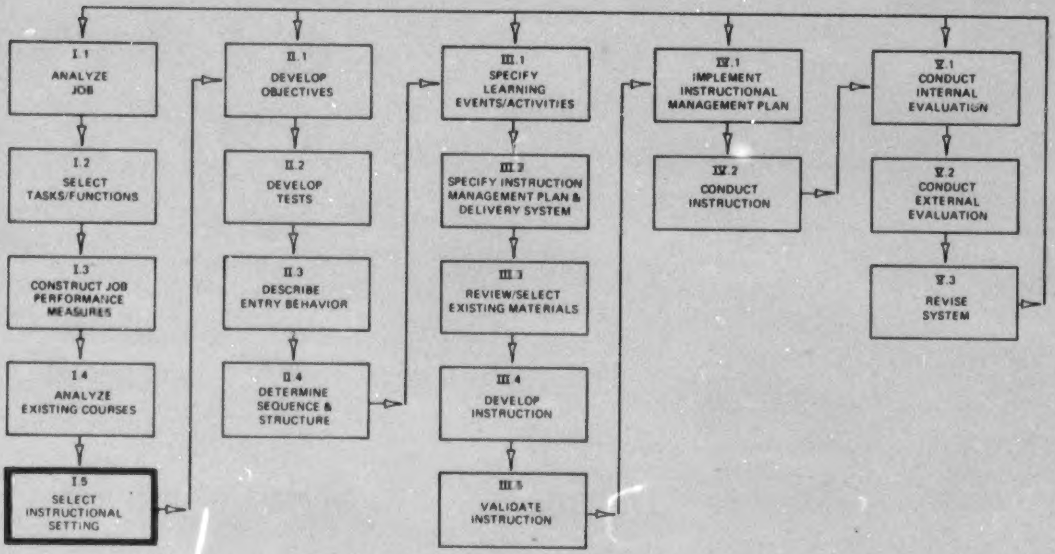

INPUTS
DISCREPANCY EXISTS BETWEEN JOB PERFORMANCE AND JOB PERFORMANCE NEEDS
DOES ANYONE DO THE JOB NOW?
YES
NO
IS THERE AN EXISTING TRAINING PROGRAM?
YES
NO
SECURE EXISTING COURSES AND THEIR DEVELOPMENT DOCUMENTATION 2.1
ANALYZE JOB ANALYSIS DOCUMENTATION 2.2
JOB ANALYSIS ACCEPTABLE?
NO
YES
BLOCK I.1
ANALYZE METHOD USED TO SELECT TASKS FOR TRAINING 2.3
TASKS FOR TRAINING SELECTION ACCEPTABLE?
NO
YES
BLOCK I.2
ANALYZE JOB PERFORMANCE MEASURES 2.4
JOB PERFORMANCE MEASURES ACCEPTABLE?
NO
YES
BLOCK I.3
ANALYZE VALIDATION DOCUMENTATION 2.5
COURSE VALIDATION ACCEPTABLE?
NO
YES
BLOCK III.5
MAKE REQUIRED REVISIONS 2.6
BLOCK IV.1

FIGURE I.27: Flowchart of Block I.4: ANALYZE EXISTING COURSE

BLOCK I.5: SELECT INSTRUCTIONAL SETTING


I.1 ANALYZE JOB
I.2 SELECT TASKS/FUNCTIONS
I.3 CONSTRUCT JOB PERFORMANCE MEASURES
I.4 ANALYZE EXISTING COURSES
I.5 SELECT INSTRUCTIONAL SETTING
II.1 DEVELOP OBJECTIVES
II.2 DEVELOP TESTS
II.3 DESCRIBE ENTRY BEHAVIOR
II.4 DETERMINE SEQUENCE & STRUCTURE
III.1 SPECIFY LEARNING EVENTS/ACTIVITIES
III.2 SPECIFY INSTRUCTION MANAGEMENT PLAN & DELIVERY SYSTEM
III.3 REVIEW/SELECT EXISTING MATERIALS
III.4 DEVELOP INSTRUCTION
III.5 VALIDATE INSTRUCTION
IV.1 IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN
IV.2 CONDUCT INSTRUCTION
V.1 CONDUCT INTERNAL EVALUATION
V.2 CONDUCT EXTERNAL EVALUATION
V.3 REVISE SYSTEM

OVERVIEW

To ensure that adequate training resources will be available when required upon the completion of development of training, an early decision must be made as to the instructional setting or settings in which the tasks will be trained. The optimum instructional setting for a task is the setting that provides the most effective and efficient training to those who require the training, at the point in time when the training is most needed by the trainees.

I.0 INTRODUCTION

An instructional setting is the vehicle or agency by or through which a trainee who initially is not able to perform a task or part of a task becomes proficient in the performance of the task or part of a task. The major instructional settings discussed in this block are:

1. Job Performance Aids (JPAs)
2. Self-Teaching Exportable Packages (STEPs)
3. Formal On-the-Job Training (FOJT)
4. Installation Support Schools (ISSs)
5. Resident Schools (RS)

Often, instruction is thought of as being limited to a school setting. This is partly because of a strong tradition for conducting training in schools even when good alternatives are available. Some reasons why instructional settings other than the school must be considered are:

1. Some tasks cannot be adequately trained in school.
2. There generally is more of a requirement for training than can be met with the school's limited resources.
3. The active services have been required to assume increasing responsibility for training the Reserves, the National Guard, and our allies, while at the same time facing reduced budgets as a result of government economy measures.

The major inputs to this Block are:

1. The tasks selected for training in Block I.2, along with the data that was collected to serve as a basis for the selection

decisions. These items are important because the tasks selected for training are the ones for which you will now select training settings, and because much of the data used to select tasks for training also will be used to select training settings.

2. The Job Performance Measures (JPMs) constructed in Block I.3, along with the JPM conditions, cues, standards, and procedures.

The JPMs are critical to this block because they indicate the environmental, facility, equipment, and personnel requirements for training. These also will have a considerable impact on the choice of training settings.

The decisions you will make in this block are:

1. Who should be trained to perform each task; that is, should everyone in the DOS be trained or only those assigned to certain units.

EXAMPLE

Three tasks performed by Aircraft Life Support Specialists might be:

1. Inspect Very pistols.
2. Construct arctic shelters.
3. Construct tropical shelters.

If most job incumbents inspect Very pistols, everyone in the DOS should be trained for that task. However, most likely only those assigned to a unit in the arctic should be trained to construct arctic shelters, and only those assigned to a unit in the tropics should be trained to construct tropical shelters.

2. When should training be provided for each task. Some tasks have a high decay rate; that is, if the task is not performed soon after training, the trained individual can forget how to perform it.

EXAMPLE

> If most Jet Engine Mechanics do not perform the task of "balance personnel workload" until they have been assigned for four years, it would be wise not to train the task until it is needed.

3. Which instructional setting is appropriate for the task. This decision involves questions of training effectiveness, efficiency, fidelity, and cost as well as the two factors just discussed.

EXAMPLE

> If most submarine sonar technicians must perform certain tasks immediately upon assignment, and if the facilities required for training these tasks are available only at the Fleet Sonar School, these tasks should be taught in school.

In this block, you will nominate each task for assignment to one of five instructional settings. Definitions of these settings are as follows:

1. Job Performance Aids (JPAs). Technically, Job Performance Aids (JPAs) are not training, but rather a substitute for training. A JPA provides step-by-step procedural guidance in the performance of a task or element. It can be a list,

> a "flowchart," "decision tree," or "algorithm" that outlines the specifics and leads the user to successful performance of the task. A cook's or baker's recipe book is a good example of a JPA. It requires certain basic skills that are used in a variety of situations: frying, deep fat frying, baking, broiling, etc., are used with different foods. Each is a separate skill that must be acquired. However, trying to remember recipes and proportions would be a hopeless waste of time. Thus, the recipe book is a cook's JPA.

The judicious use of JPAs can contribute significantly to training economy and effectiveness, and their use has been responsible for important job performance improvements. Some tasks can be done completely with JPAs if those performing the task have mastered the use of the necessary tools such as wrenches, levers, hammers, screw drivers, meters, and gauges. This does not imply that they could perform all tasks without supervision; however, very few individuals in the military are required to work without supervision. Also, unlike information that once learned is quickly forgotten if not used, JPAs are not subject to decay. While names, weights, tables, and procedures are forgotten more quickly than rules and motor skills, JPAs can effectively support the job incumbent's memory by storing the names, weights, tables, and procedures in a convenient form near where the task is performed.

Decals attached to equipment represent a simple form of JPA. Maintenance charts, procedural guides, and signs represent other simple applications. However, those that probably have the potential for the highest payoff are ones that contain decision trees or flowcharts. These JPAs can be used in troubleshooting, repairing, and following instructions and procedures that require decisions involving a number of options. Some JPAs are used as a substitute for training when task performance can be accomplished that way. The more complex types, often called "Fully Proceduralized Job Performance Aids" usually rely on basic skills acquired by trainees and training on the use of the JPA. An example is shown in Figure I.28.

2. Self-Teaching Exportable Packages (STEPs). The distinguishing features of self-teaching exportable packages are that they are designed to be used without an instructor present, and they generally can be sent to or used by the student wherever he is stationed. Such packages may include printed materials, audio or audio/visual delivery systems, relatively small training kits of tools and items to be assembled, repaired, or operated, and any other compact, transportable items. Also, the course may be designed to make use of facilities and equipment known to be available to the students. Self-teaching exportable packages (STEPs) include but are not limited to correspondence courses.

While an instructor is not required at the student's location, assistance often is available by correspondence with the issuing agency. STEPs generally are intended for individual use and can be used by the individual on his own time. However, STEPs also may be used by two or more individuals meeting together holding discussions and critiques for their mutual benefit. STEPs generally include a testing program whereby the course tests are either administered by a designated local official or

DAILY INSPECTION CHECKLIST TM 55-1520-228-20PMD

The Daily Inspection will be accomplished following the last flight of the day or preceding the next day's flying. The inspection consists of visual examination and operational checks to determine that the aircraft can safely and efficiently perform its assigned mission.

Seq. No.	Item and procedure	Para.
	NOSE AREA	
1.1	Inspect aircraft forms and records for recorded discrepancies (TM 38-750).	
1.2	Nose section exterior for visible damage.	4-2
1.3	Nose section interior for cleanliness; equipment for visible damage and loose connections.	4-2
1.4	Pitot tube and static ports for obstructions and cleanliness.	10-5
1.5	Windshields and windows for cleanliness.	4-14
	CABIN AND LANDING GEAR AREA	
2.1	Cabin exterior for damage.	4-2
2.2	Check fuel for water and other contamination. Drain fuel sump (use sample jar).	5-21
2.3	Landing gear for damage, security of attachment and underside of fuselage for damage and/or corrosion.	4-25
2.4	Crew and passenger doors; for positive latching and proper operation, windows for cleanliness and damage.	4-4
2.5	Cabin interior for cleanliness, proper stowage of equipment and visible damage.	4-2
2.6	Fire extinguisher for designated location.	4-20
2.7	First aid kits for designated location, presence of inspection date tag, broken or missing seal, and security.	4-19
2.8	Seats for security and webbing for damage.	4-9 and 4-10

FIGURE I.28: Example of A Job Performance Aid (JPA)

by correspondence with the issuing agency. In order to qualify as a STEP, a package must provide feedback to the trainee on his performance and must have been developed by the procedures in Block III.4 or similar procedures.

3. Formal On-the-Job Training (FOJT). FOJT is a planned training program designed to qualify or upgrade people, through self-study and supervised instruction, to perform in a given DOS while actually working on the job. The programs are normally designed and supported by proponent schools. The training is conducted in the actual work situation generally by designated supervisors who also work in support of the unit mission.

The FOJT supervisor is carefully selected on the basis of his having the knowledge and experience to conduct training and administer Job Performance Measures. He is ordinarily the best qualified senior NCO available. He maintains the FOJT records and forms and selects, trains, and counsels students. The FOJT supervisor prepares task breakdowns for each trainee, instructs, motivates, and evaluates trainees. FOJT requires comprehensive planning, careful scheduling, timely implementation, capable direction, skillful application, and expert evaluation. Therefore, it must be used only where the necessary manpower resources are available.

FOJT generally is used where tasks are complex and can be learned faster or to a higher proficiency level with hands-on experience. Such programs can be particularly effective for people assigned to a unit or ship having hardware or weapon systems new to them. Another major advantage is that most programs permit the trainees to make a positive contribution to the job while they are being trained to perform more advanced tasks.

4. Installation Support Schools (ISS). An installation support school (ISS) is organized and operated by individual units or commands to meet local training requirements. While such schools may not have the broad range of training resources usually available at a resident school, they have the advantage of being near the actual equipment or facilities used by the local unit. Often this equipment and facility can be used for training purposes by the installation support school. These schools generally are responsive to short-notice training needs. In addition, trainees often can receive training at the installation support school while at the same time continuing to perform all or part of their assigned duties.

5. Resident Schools (RS). Resident schools (RS) serve to meet service-wide training requirements. Such schools in each service are controlled by training headquarters. The schools respond to active duty, reserve, and national guard training requirements as well as some federal government and allies requirements. Resident schools generally develop their own training programs and often develop courses for installation support schools, FOJT programs, correspondence courses, and other support training literature. Students are assigned to resident schools by the services personnel system or by units on a space available or quota basis.

As a central or regional training center with a wide range of training responsibilities, a resident school often has a variety and sophistication of training resources not likely to be found in other settings. These advantages, however, often can be off-set by the costs of trainee housing, travel, and time away from other assigned duties. Also much training does not require such highly sophisticated resources.

While the above instructional settings are the ones to which you will nominate tasks in this block, this does not mean there are no other legitimate settings for other types of training. For example, group training is a traditional system for communicating information on selected topics. The usual approach has been to gather groups together and to designate someone to present the information or demonstrate the skills to the audience. It is much like a classroom/lecture situation, and as in that situation, it is possible to use other delivery systems as a substitute for the lecturer. It is effectively used to satisfy essential personal knowledge training not related to specific duty assignments, such as drug abuse and race relations, and for required reviews such as chemical, biological, and radiological warfare training.

Another setting is generally referred to as work experience. It is nonstructured with little or no formal supervision, is not necessarily progressive, and does not require performance tests. The trainee may get help by asking another job incumbent, by observing another incumbent, or by using a job performance aid. Work experience can be useful where the trainee has prior or simultaneous instruction at school or by self-teaching exportable packages. It gives hands-on experience which usually increases interest in training and allows for the trainee to be productive while being trained. It can be particularly effective in a job location where there are a large number of incumbants performing the same tasks. Work experience may be used for tasks not selected for training in Block I.2.

Costs are a critical factor in all phases of the ISD model. The primary concern is that money spent for training be spent efficiently. Careful consideration of costs should reduce the number of "surprises" such as unpredicted expenses incurred in a training program as a result of failure to take the full system into account.

Is it cheaper to offer a self-teaching exportable package (STEP) than to offer resident school (RS) training? In the short term, in cases where STEP can meet the same training need as RS, the cost of developing and using STEP may actually be higher than the cost of an RS course. However, in the long run, STEP training may prove to be less expensive than RS.

What about FOJT? Generally, FOJT is thought to be cheaper than RS in those cases where both can meet the training need. But, for FOJT to be effective, a management system is required to handle the instruction and materials. If the entire system has to be built it will require many years to pay back the development and implementation costs. While a savings may eventually be realized, all factors in the system must be considered before one can say that FOJT is less expensive than RS.

Each service is based on a different organization and has different mixes of resources and capabilities. What will work well in the Air Force, FOJT for example, cannot work as well in the Army until the management system is available because the Army has not depended on FOJT as a part of their total training system. The Navy is well established and organized for extensive FOJT. So, in part, your recommendations for training setting will depend heavily upon whether you are concerned with the Army, Navy, Air Force, or Marines and upon the capabilities you have for developing instruction.

Because of these considerations such as the different organizational structures in the different services, the ISD method for considering costs of proposed training settings is as follows:

The initial recommendation of assignment of tasks to settings should be based on the procedures to be described in this block. The procedures are based primarily on factors other than costs. This recommendation for assignment must be accomplished in a manner that is in accord with ISD procedures and also in reasonable accord with local requirements. After the initial recommendation is made, the recommendations should be reviewed with affected local management. Local managers will be in the best position to know specific costs in their services, what resources are available, time requirements to react to demands placed upon them, and other pertinent facts that effect the cost of training.

A process of negotiation and trade-offs must be carried out, based on the technical considerations revealed by the procedures described in this block and the management requirements for carrying out the decisions reached. This negotiation may reveal alternatives which have not been considered before or which have not been given serious consideration. This trading off of technical and management requirements that results in the final assignment of tasks to instructional settings must be a cooperative management effort that takes into consideration the best available cost information. As the costs associated with each setting become more widely available, these data can be used in making the initial selection of settings.

The procedures for selecting the instructional setting consist of using data collected in Block I.2, the job performance measures developed in Block I.3, and personnel assignment information collected in this block to:

1. Determine if a task should have a JPA developed
2. If the task is not assigned to a JPA, select the appropriate instructional setting from among the remaining settings. This selection is based on:
    a. training supervision requirements
    b. training resource constraints
    c. at what point in time in the individual's service career performance of the task will be required
    d. decay rate of the task
    e. the percent of the DOS performing the task
    f. the number of individuals to be trained and, if a large number of individuals must be trained simultaneously, the size of the groups.

The steps in carrying out these procedures are shown in Figure I.29, the fold-out page at the end of this block.

The output of this block will include a recommended instructional setting for each task. As with many other steps in the ISD process, some of the decisions made in this block may be modified later when new information becomes available as the instructional program is developed. The final instructional setting selection, for example, may assign parts of a task to different settings.

EXAMPLE

> Certain basic skills such as using hand tools, following an electrical wiring diagram, or operating simple test equipment might be taught in school, and a large number of tasks that require the above skills might be taught FOJT.

The organization of the armed services generally results in the instructional setting selection being done early as part of the analysis phase. This permits early management awareness of future training facility and manpower requirements. A high level of management should be involved in instructional setting selection, since the final decisions often must be compromises between perceived training needs and proposed training resources allocations.

There are three principal purposes for giving serious consideration to setting selection:

1. To insure that training is effective wherever it is conducted.
2. To insure that effective training is conducted at the lowest cost possible.
3. To insure that necessary increases in the costs of training are thoroughly justified on the basis of increased effectiveness.

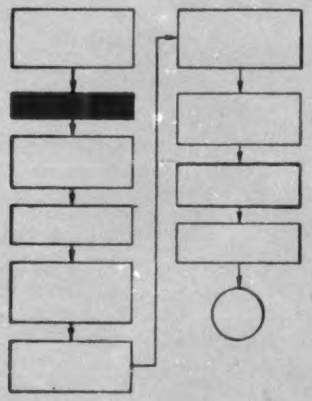
To be able to make all of these decisions totally on the basis of known factors and costs would be the ideal situation. These data are not now available in precise form, but each service has collected enough data to provide a good starting point.

The recommendations and procedures that follow are based on reviews of current practices, research data that typically deal with only one setting at a time, and estimated benefits and constraints of alternatives. To establish more valid criteria for selection will require considerable time and experience.

It is recommended practice that those responsible for the development or conduct of training in each of the alternative settings be consulted prior to the final assignment of a cluster of tasks to a setting. These discussions should reveal any potential problems before final decisions are made.

2.0 PROCEDURES

2.1 Cluster Tasks



While it may be desirable, and even necessary in some cases, to assign each individual task to a setting, it is probably more efficient to cluster tasks before proceeding. Clustering is a process of recognizing conditions and constraints which would strongly influence or control the setting selection. These general conditions and constraints include the following:

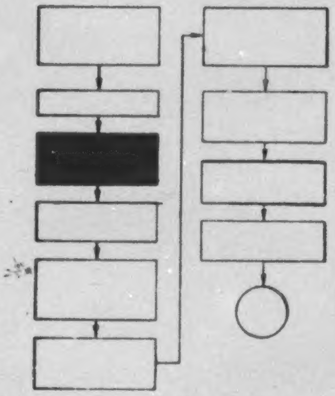
1. Skill level or rank of the trainee. Trainees early in their careers are more likely to perform some tasks than others. If the task is performed by all skill levels in a DOS, it will require different consideration than if it is performed mainly by one skill level. A first clustering should be made on the basis of the skill level.

2. Need for special facilities, equipment, or personnel. Some settings will be eliminated when there are special needs for facilities and equipment such as gunnery ranges, submarines, aircraft, and overhaul and repair shops. Some tasks require the use of specialized personnel in the training or testing of the task. If these special resources are required, the tasks should be clustered according to the special requirements.
3. Other constraints. The third step is clustering any other tasks which have constraints not listed above.

The remaining tasks should, whenever possible, be clustered with similar tasks. If some tasks are left over, each of them must be treated as a cluster.

2.2 Determine for Which Tasks Job Performance Aids Should be Developed

The next step in selecting instructional settings is to determine which tasks or parts of tasks would not have to be trained if JPAs were developed. Tasks that can easily be performed by using JPAs then can be assigned to that setting and deleted from your list of tasks for which other settings must be selected.



Some tasks have a high delay tolerance; that is, considerable delay can be tolerated between the time the need for task performance becomes evident and the time actual performance must begin. Such tasks are good candidates for development of more complex JPAs.

EXAMPLES

1. Issue supplies against approved orders.
2. Refill fire extinguishers after use.
3. Complete SF 91 form following an accident.
4. Answer telephone inquiries.
5. Repair aircraft servicing equipment.

It is not essential to design a single JPA for use everywhere the task is performed. For example, while the above task of "answer telephone inquiries" might easily be performed by using a JPA, the JPA might have to be adapted to local needs. The responsible agency for developing JPAs could develop JPAs to serve the different needs of each using command, or issue an instruction that would assist each using command in developing their own JPA. If the JPA is carefully developed, nothing else may be required: the incumbents can satisfactorily perform the task simply by following the JPA.

For some tasks, any delay in correct performance would cause damage to equipment, endanger personnel, or render performances of the task useless. It is not reasonable to depend solely on complex JPAs for such tasks.

EXAMPLES

1. Provide first aid for severe bleeding.
2. Snap fire at an unexpected enemy.
3. Secure submarine for emergency dive.

In the previous example, decals and attached reference labels might be used in some instances.

Several other factors must be considered when deciding for which tasks JPAs should be developed:

1. Task complexity. Tasks that follow a relatively set procedure, consist of relatively easy to follow steps, but are not performed often enough to be easily remembered, are good candidates for JPAs. Frequently performed multiple tasks where the procedures are complex require more complex JPAs and consequently more JPA development time.

EXAMPLES

1. The jet engine mechanic's task of "tag engine containers" follows a set procedure of relatively few, simple steps. The actual tag might also be the JPA. Here, the JPA could be a substitute for training.
2. The jet engine mechanic's task of "install engine in aircraft" is much more complex. While some form of JPA probably is available for double checking critical items, to depend completely on the JPA would be unrealistic. Here, it would be necessary to provide training on the use of the JPA and perhaps training on basic skills.

2. Task conditions. Certain physical conditions such as location, weather, and available space, under which the task must be performed could make use of a JPA impractical.

EXAMPLES

1. The operator of certain underwater rescue equipment might be in such a cramped position, he would not be able to read a JPA.

2. If a task must be performed in total darkness, a complex JPA would be useless.
3. There might not be room in a tank or submarine for a number of bulky JPAs such as those used in maintenance tasks.
4. Tasks performed in frigid weather or heavy rainfall might not be suitable for JPAs or would have to be specially designed for those conditions.
5. If the consequences of inadequate performance of a task are severe, and if there is a possibility that the JPA will be lost, damaged, or destroyed, total dependence should not be placed on the JPA

3. Task physical skills requirements. JPAs generally are not suitable for tasks that require a high degree of physical skill.

EXAMPLES

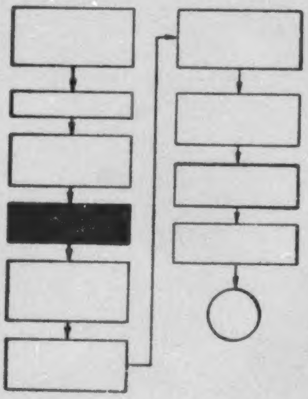
1. Hitting a target with an M-16 rifle.
2. Flying a jet aircraft at tree-top altitude.

Using the above factors as a guideline, determine if a JPA should be developed for the particular tasks under consideration. If the decision is not to develop a JPA, you should proceed to the following sections and make a setting decision. However, if the decision is to assign the task to a JPA, the procedure described below must be followed.

1. The JPA is developed and validated by the group responsible for this activity in your services. Development of JPAs is discussed in Block III.4.

2. Use of the JPA by job incumbents will change the conditions under which the task is performed, and may change the elements that make up the task. The task will not be the same as it was before the introduction of the JPA.
3. This revised task may or may not be selected, in Block I.2, for training. If the task can easily be performed simply by using the JPA, it will not be selected for training, and you will have no further concern with it. If the revised task is selected for training, because even with the JPA some training is required, the revised task will end up back at this point in this block to be assigned to one of the remaining instructional settings.

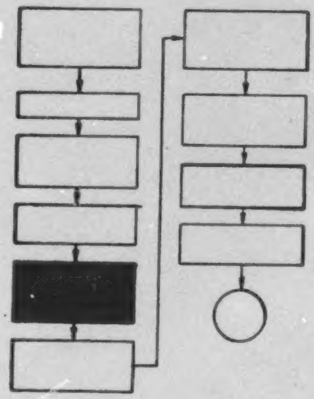
2.3 Secure Required Personnel Assignment Data



Most of the information you will need for making instructional setting decisions is already available from the previous blocks in this model. However, several critical items must be secured from other sources. Some of the factors upon which assignment of a task to an instructional setting is based are the probable numbers, group sizes, and locations of those who will be required to learn the task. The implications for assignment of a task to a setting when approximately one individual per day is assigned to a DOS in units in various parts of the world is considerably different than if 365 people must be trained at the same time at the same location.

The required data can usually be obtained from the personnel section at your school. While such information often is estimated rather than in specific predetermined figures, the estimates should be sufficient as a basis for your decisions in this block.

2.4 Determine if Tasks Should be Nominated for Self-Teaching Exportable Packages (STEPs)



No single factor controls nomination of tasks to the remaining instructional settings. No rules can be stated that prescribe a specific setting for a task. However, guidelines are given that should prove helpful in making logical decisions. Details of these guidelines are given in the remainder of this block.

The appropriate instructional setting for nomination of the cluster of tasks is a self-teaching exportable package (STEP) if:

1. Training of the tasks is not likely to require close supervision,
2. There are no critical resource constraints (everything required for training can easily be included in the training package, or is readily available to the user),
3. New assignees to units are not required to perform the tasks (there is time for learning before the tasks are required), and
4. Practice is not the primary factor in performance of the physical skills involved.

If the cluster of tasks meets all four of the guidelines listed, it can be nominated for STEP. If one or more of the guidelines are not met, the tasks should be considered for nomination to one of the remaining settings. Following is a discussion of each of the guidelines listed previously.

1. Training of the tasks is not likely to require close supervision. The important factors here are whether relatively unsupervised training could result in injury to personnel or damage to equipment, and whether immediate feedback from a supervisor is likely to be required to learn the tasks. A wide variety of these tasks exist and some are more suitable than others depending on the needs of the service.

EXAMPLES

1. Contract administration and drafting tasks would not likely require immediate supervision and could be trained without risking injury to personnel or damage to equipment. Such tasks are candidates for STEP.
2. "Install jet engine bearings" would not be a candidate for STEP since close supervision would be required while the trainee is learning parts of the task.

2. There are no critical resource constraints. If everything required for training the tasks can easily be included in the training package, or is readily available to the users, the tasks remain a candidate for STEP. If special facilities, environmental conditions, terrain, or equipment are required, the tasks should not be considered for STEP unless there is

reasonable certainty that such resources will be available to the trainees. Usually STEP programs are limited to tasks where the necessary equipment and other resources are easily and inexpensively exportable to the trainee or available wherever he is stationed. Also, since STEP training generally is a part time activity for the trainee, any required training equipment sent to him is not likely to be fully utilized. Therefore, the cost of equipment must be given careful consideration.

EXAMPLES

1. Printed materials, audio-visual aids, small hand tools, and small kits such as radio construction kits are examples of items that can be included in a STEP.
2. Tasks that require a gunnery range, an aircraft, or a Link trainer usually are not candidates for STEP.

3. New assignees to units are not required to perform the task.

A STEP can be used if there is sufficient time for the trainee to learn the tasks before he is required to perform them. One way to make this determination is to examine data from Block I.2 on time between job entry and task performance. This is discussed in detail in Section 2.1.1.8 of Block I.2. You should use estimates of task learning difficulty obtained from I.2 as one estimate of this time, and the time between job entry and task performance as a second. If tasks require a long time to learn, other settings may be more efficient.

The estimated time for learning some tasks may be short, possibly one hour or less. There usually is sufficient time for trainees to learn such tasks after assignment if only a relatively small number of tasks are involved. If a large number of these tasks are involved, the total learning time might be such that some or all of the tasks would require training before beginning the job. This will be discussed further in section 2.7 of this block. At this point you should base your decisions on the requirements of the task in the cluster. Later you will make any necessary adjustments.

An example of part of a computer printout of the percent of job incumbents who perform certain tasks is shown in Figure I.30. The column under SPL006 shows the percent of members performing the task who have been assigned to the DOS for 1-12 months. The other three columns show the percentages for members performing who have been assigned for longer periods of time. The printout for the first task shows that only 1.109 percent of incumbents perform the task during the first 12 months of service. For this task, there is ample time to learn the task before performance is required.

As a general guideline, if the task is performed primarily by assignees who have been on the job for more than one year, the task remains a candidate for STEP training. According to this guideline, task 3 would ordinarily not be a candidate for STEP training since it is performed primarily by first year assignees.

4. The task has a high decay rate, or 25 percent or more of those in the DOS do not perform the task. If the task has a high decay rate; that is, the task requires skills that

```
Task Group Summary

Percent Members Performing

D   TSK     SPL006               SPL007               SPL008               SPL009
B    1       1.109                8.595               57.292               80.000
B    2       3.487               15.723               47.569               72.500
B    3      14.29                 9.249                6.757                3.636
B    4       2.694                7.547               30.208               63.333
B    5       5.455                6.757               10.909               20.231
B    6       2.967                6.081               16.364               14.451
B    7       8.716               24.948               64.931               77.500
B    8       5.455               21.959               41.818               46.821
B    9       1.971                4.392               20.909               28.324
B   10       1.902               11.950               53.819               79.167
B   11      18.234               23.649               27.273               36.416
B   12       7.132               25.157               68.750               85.000
B   13       4.348               13.176               17.273               22.543
B   14       4.348               10.811               20.909               23.699
B   15       6.973               22.013               64.236               81.667
```

```
Note:  SPL006 = 1-12 Months
       SPL007 = 13-24 Months
       SPL008 = 25-36 Months
       SPL009 = 37-48 Months
```

Figure I.30: Example of Computer Printout of Percent of Members Performing

the job incumbent must use regularly in order to remain proficient, the task remains a candidate for STEP training. The reasons for this is that STEP training can be given at the point in time when the trainee will shortly be in a position to use the task, thus retaining the acquired skills. On the other hand, if the task has a low decay rate; that is, it can be learned long before it is required and still be performed adequately when needed, and if most of the DOS perform the task, the task may be trained more efficiently in a different setting. Such tasks usually should not be assigned to STEP training.

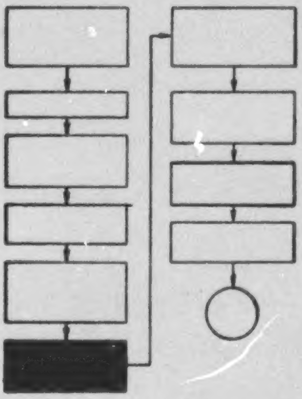
As was pointed out earlier, if the tasks meet all four of the guidelines discussed above, they should be tentatively considered for STEP. Some examples of tasks that might be assigned to STEP are:

EXAMPLES

1. transcribe international Morse Codes
2. prepare data processing flow charts
3. administer contracts
4. draw technical charts and graphs
5. provide industrial safety plans
6. interpret radar weather detection data
7. investigate motor vehicle accidents
8. provide press releases

Task 1 has a high decay rate. It could be assigned to STEP if your survey data from Block I.2 indicate that new assignees are not required to perform the task. Tasks 2-8 have lower decay rates. They could be assigned to STEP if new assignees are not required to perform them.

2.5 Determine if Task Should Be Nominated for Formal On-the-Job Training (FOJT)



The appropriate instructional setting for nomination of the cluster of tasks is a formal on-the-job training (FOJT) program if:

1. Assignment of trainees to units is made in sufficiently small groups and spread over a sufficiently long period of time for training of the task to be absorbed by a FOJT program,
2. There are no critical resource constraints (everything required for training can easily be provided in the job setting), and
3. New assignees to units are not required to perform the tasks (there is time for learning before the tasks are required).

If the cluster of tasks meets all four of the guidelines listed above, it should be tentatively considered for FOJT. If one or more of the guidelines are not met, the tasks should be considered for assignment to one of the remaining settings. Following is a discussion of the guidelines listed above.

1. One of the limiting factors for FOJT is the number of individuals who can be trained at one time. FOJT is usually dependent upon close supervision by qualified personnel.

This limits the number of trainees to those for whom such supervision can be provided. In addition, since FOJT assumes that trainees will work with the real-world job facilities and equipment, the availability of facilities and equipment in the job setting limits the number of trainees. The decision as to the numbers of trainees who can reasonably be absorbed into FOJT must initially be based largely on inputs from units where the FOJT likely would take place.

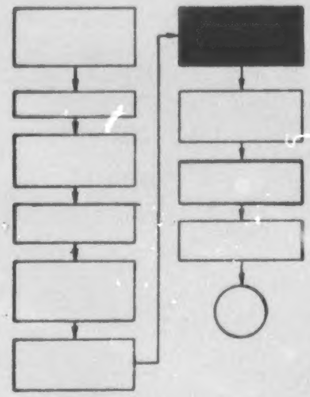
2. In addition to the resource constraints mentioned above, FOJT should be selected as the training setting only if the resources for training are available or can easily be made available on the job. Since training has not yet been developed, you must make assumptions about training requirements based on the job performance measures (JPMs). If the JPM requires a great deal of simulation, particularly if it requires a simulator that is not normally used when performing the task, FOJT should not be selected as the instructional setting.
3. There must also be a local management system to supervise the FOJT program.

As was pointed out earlier, if the cluster of tasks meets the guidelines discussed above, it should be tentatively considered for FOJT. This does not mean STEP cannot still be included as part of the training program. Selecting FOJT as the instructional setting means that primary responsibility for training rests on those who administer the FOJT, and that a major portion of the training takes place on the job. STEP can be used to support or supplement the FOJT. Some examples of tasks that probably could be assigned to FOJT are:

EXAMPLES:

1. install engine bearings
2. reface engine valves
3. replace refrigerant reheat valves
4. set up mobile radio equipment
5. make radio phone patches
6. coordinate air to ground traffic
7. install high-voltage lines
8. splice cables
9. grade roads
10. perform pre-flight check procedure

2.6 Determine If Task Should Be Nominated For Installation Support Schools (ISS)



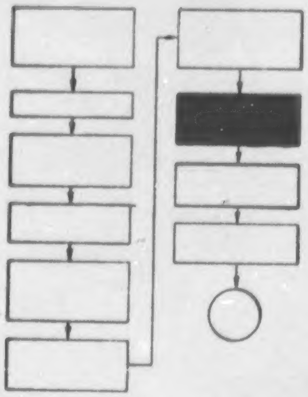
The instructional setting nominated for the cluster of tasks may be an installation support school (ISS) if:

1. There are no critical resources constraints (everything required for training can easily be provided at the installation support school or schools for the unit or units where the training is required), and
2. The tasks have a high decay rate.

If the cluster of tasks meets the guidelines, it could be tentatively assigned to ISS. Along with this assignment, you should make a recommendation as to whether the tasks should be trained to all members of the DOS or only at specific ISS for individuals assigned to specific units. Consider the task of "construct arctic shelter." There are several reasons for recommending that this task be taught only at certain ISS to individuals assigned to specific units. First, the training resources will be found only in ISSs in frigid climates. Further, only the members of the DOS in these specific locations are likely to perform the task. This points out one of the major advantages of ISS. ISS is one means of minimizing training a large number of individuals who are never likely to perform the task, or of training individuals long before the training is required. If new JPAs are to be introduced, training in their correct use could be provided in ISS.

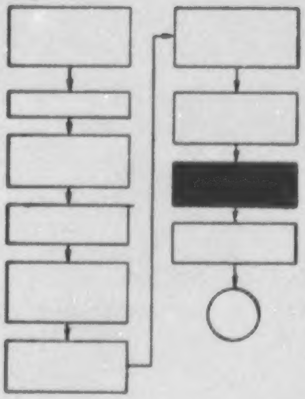
2.7 Determine if Tasks Should be Nominated for Resident School (RS)

Where large groups of individuals must be taught the same thing at the same time, RS can often provide effective and efficient training.



After you have nominated one cluster of tasks for an instructional setting, you should repeat the procedure for each task cluster until all have been nominated.

2.8 Review Nominations and Revise as Required



Once you have nominated clusters to instructional settings, you should review your setting selections and possibly change some of them. Some reasons for this are:

1. You might have assigned so many tasks to STEP or FOJT that there is not enough time to train the tasks before they must be performed.
2. You might have assigned so many tasks to FOJT that the units cannot handle that much FOJT without disrupting their essential work activities.
3. So few tasks might have been assigned to a setting that administrative costs outweigh any advantages of training the few tasks in a different setting. This is particularly true if only a small number of individuals require training.
4. Resource and time constraints in the development of training would delay onset of training.
5. The management review of the nominations might reveal that training in one setting was much less expensive than the same training in another setting. This information will be cumulative through time, but will be handled on a case-by-case basis until experience allows easier cost comparisons.

The management review may discover many problems or difficulties with the initial assignments, particularly in the areas of costs and overloading certain parts of the system. Some tasks will be reassigned to other settings for reasons of immediate practical necessity. However, through time, changes in policies and training emphasis will occur as the data base improves.

There often are good reasons to assign a task to two or more settings with the understanding that parts of the task or different degrees of proficiency in performing the task will be taught at each setting. In some cases there are needs for alternative settings for the same task.

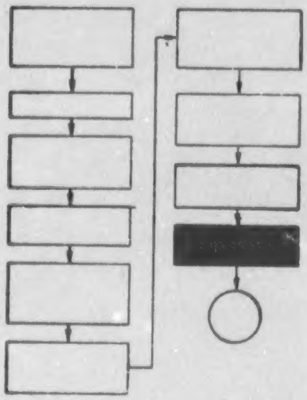
EXAMPLE

> Training the task of "repair electronic components" might profitably be assigned to several settings. Some of the fundamentals such as soldering connections, using common tool and test equipment, and identifying components might be taught in RS or ISS. Once these entry level skills are mastered, the trainee might complete his training FOJT.

While at this point in the model, since training has not yet been developed, you cannot make a final decision as to which part of a task will be trained in which setting. However, a tentative decision at this point to assign a task to more than one setting often is a practical option. To do this, you will have to make assumptions about training, based on the task documentation and the JPM. To determine which settings are practical requires the same kinds of discussion outlined previously in Sections 2.3 - 2.6.

2.9 Secure Management Approval

As was discussed earlier, the final decisions on assignment of tasks to instructional settings generally is made by a process of negotiation and trade-offs at a higher management level. However, these final decisions cannot be realistically made unless you have provided a logical base for nominations of tasks to settings. This logical base will result from careful consideration of the guidelines given in this block.



3.0 OUTPUTS

The outputs of this block should consist of:

3.1 Products

The instructional setting or settings to which each task was assigned

Note: Implied in the setting selection are decisions as to whether each task should be trained to all in the DOS or only to certain units and the point in an individual's service career at which each task most likely will be trained.

3.2 Other Documentation

1. Any explicit statements of specific units or individuals who should or should not be trained for a specific task, and the rationale for the statements.

2. A statement of any specific ISSs where training should be assigned, and the rationale for the statement.
3. Any specific critical unit inputs, resident school inputs, or constraints that affected the selection process.
4. A summary statement of any revision to the original setting selection, and the rationale for the revisions.
5. Any other comments, findings, or suggestions that could impact the instructional design and development.

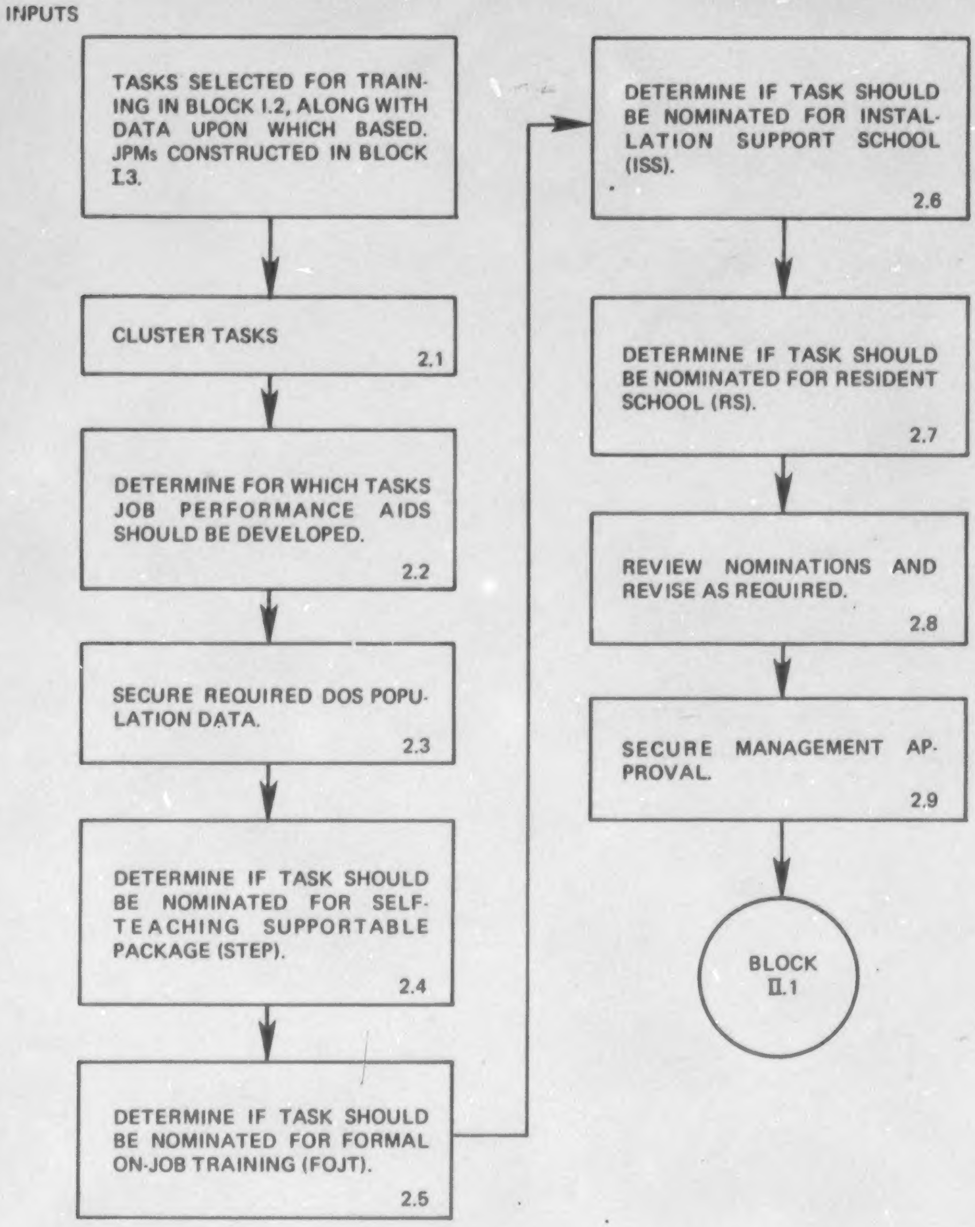

INPUTS
TASKS SELECTED FOR TRAINING IN BLOCK I.2, ALONG WITH DATA UPON WHICH BASED. JPMs CONSTRUCTED IN BLOCK I.3.
CLUSTER TASKS 2.1
DETERMINE FOR WHICH TASKS JOB PERFORMANCE AIDS SHOULD BE DEVELOPED. 2.2
SECURE REQUIRED DOS POPULATION DATA. 2.3
DETERMINE IF TASK SHOULD BE NOMINATED FOR SELF-TEACHING SUPPORTABLE PACKAGE (STEP). 2.4
DETERMINE IF TASK SHOULD BE NOMINATED FOR FORMAL ON-JOB TRAINING (FOJT). 2.5
DETERMINE IF TASK SHOULD BE NOMINATED FOR INSTALLATION SUPPORT SCHOOL (ISS). 2.6
DETERMINE IF TASK SHOULD BE NOMINATED FOR RESIDENT SCHOOL (RS). 2.7
REVIEW NOMINATIONS AND REVISE AS REQUIRED. 2.8
SECURE MANAGEMENT APPROVAL. 2.9
BLOCK II.1

FIGURE I.29: Flowchart of Block I.5, SELECT INSTRUCTIONAL SETTING.

REFERENCES

REFERENCES

PHASE I

Block I.1

Christal, R. E. The United States Air Force Occupational Research Project. In The state of the art in occupational research and development. Symposium presented at the Navy Personnel Research and Development Center, San Diego, Calif., July 10-12, 1973.

Some aspects about the techniques developed by the Air Force for collecting, analyzing, and reporting occupational data are reported. The job inventory method of collecting work-task information from large numbers of workers is described. This technique was chosen by the Air Force because of its economy, the quantitification of the job data and subsequent ease of handling by computer, and the fact that the information can be validated and checked for stability.

Department of the Air Force. Instructional system development (AFM 50-2). Washington, D.C.: Headquarters, United States Air Force, Air Training Command, December 1970.

This manual serves as the guide for applying the Air Force systems approach to the development of education and training programs. It presents a technology of instructional design, and presents the model for developing cost-effective instructional systems. This manual applies to all education and training personnel who plan, develop, approve, administer, or manage Air Force instruction and its supporting materials.

Department of the Air Force. Handbook for designers of instructional systems: Task analysis (Vol. II, AFP 50-58). Washington, D.C.: Headquarters, United States Air Force, July 1973.

Part of a five-volume approach to instructional design, this Air Force pamphlet describes in detail the breakdown of a job into its subcomponents. It further explains how the Air Force accomplishes job analysis. In addition, this volume details the procedures for identifying and establishing Job Performance Requirements (JPRs) and the Training Requirements (TRs).

Department of the Army. Systems engineering of training (course design) (TRADOC Reg 350-100-1). Ft. Monroe, Va.: Headquarters, United States Continental Army Command, May 1968.

The systems engineering approach to course design provides an orderly process of gathering and analyzing job performance requirements, of preparing and conducting training, and of evaluating and improving the effectiveness of the training program. Job analysis, the first step in systems engineering, consists of identifying the job and developing the task inventory--both of which serve as the framework within which all subsequent steps follow.

Morsh, J. E., & Archer, W. B. Procedural guide for conducting occupational surveys in the United States Air Force (PRL-TR-67-11). Lackland Air Force Base, Texas: Personnel Research Laboratory, Aerospace Medical Division, Air Force Systems Command, September 1967.

The procedural guide sets forth in detail the procedures for collecting, organizing, analyzing, and reporting information describing work performed by Air Force officers and airmen. Specific steps in the application of the Air Force method of job analysis are presented in chronological order.

Tracey, W. R. Designing training and development systems. New York: American Management Association, Inc., 1971.

Several chapters in this book are useful when dealing with the job analysis phase of the design and development of an instructional system. Tracey's systems emphasize the importance of building a training program on job-relevant data and he describes methods for data collection that are intended to be accurate reflections of the person on the job.

Tracey, W. R., Flynn, E. B., & Legere, C. L. J. The development of instructional systems: Procedures manual. Fort Devens, Mass.: United States Army Security Agency, 1970.

This manual details procedures for achieving training objectives which have been based on valid job data. The procedures outlined that are to be used in performing job analyses are built upon objectively-collected job data based upon the man on the job in the field. Such procedures eliminate the inclusion of irrelevant content, the omission of required content, misplaced emphasis, and ultimately, an undertrained or overtrained man.

REFERENCES

PHASE I

Block I.2

Department of the Navy. *Design of courses of instruction* (MCO P1510.23A). Washington, D.C.: Headquarters, United States Marine Corps, November 1972.

When the job analysis has been completed, the master list of duties, tasks and task elements identifies the mental and manual skills, knowledge, and attitudes required. The selection of tasks to be taught in the school environment implies a selection of tasks to be taught elsewhere, most probably on the job. Guidelines to assist in the determination of the tasks to be included in formal training are discussed and the behaviors the individual must perform in a field environment are emphasized as necessary training considerations in this document.

McCluskey, M. R., Jacobs, T. O., & Cleary, F. K. *Systems engineering of training for eight combat arms MOS* (HumRRO draft technical report). Alexandria, Va.: Human Resources Research Organization, June 1973.

The basic objective of this project was to develop task inventories and job task data for 93 duty positions in eight of the key combat MOSs (11B, 11C, 11D, 11E, 13A/B, 13E, 16P, and 16R) using systems engineering. Much of these task inventories were validated and indicate the extent to which task statements are common across various combinations of duty positions. Based on the degree of non-commonality, the results also include implications for the reorganization of an MOS.

REFERENCES

PHASE I

Block I.3

Department of the Air Force. *Handbook for designers of instructional systems: Task analysis* (Vol. II, AFP 50-58). Washington, D.C.: Headquarters, United States Air Force, July 1973.

This volume, part of a five-volume series of manuals on instructional design, outlines procedures for a job task analysis. The process of determining the tasks required of the job holder and the standard of performance results in job performance requirements. Determining the changes needed in skills, knowledges, and attitudes, so that they can reflect the job, become training requirements. Both of these requirements are major instructional design activities within this volume which later serve as inputs to developing objectives.

Department of the Army. *Systems engineering of training* (TRADOC Reg 350-100-1). Ft. Monroe, Va.: Headquarters, Training and Doctrine Command, April 1972.

Since training objectives are derived from training content, training objectives cannot be limited to those things that are easily measurable within the school environment. This manual suggests the use of evaluation criteria to insure the successful accomplishment of the training objective. Evaluation criteria include action, conditions, and standards, and ideally, approximate the requirements of the training objective.

Gropper, G. L. *A technology for developing instructional materials: Plan simulation based on instructional and logistical needs* (Vol. E). Pittsburgh, Penn.: American Institutes for Research, 1971.

This manual, part of a multi-volume set, provides instructions on the use of a programmed, self-instructional, transportable training program in instructional technology. In particular, this volume emphasizes using simulation based on data about criterion behaviors.

Johnson, E., & Mirabella, A. Test fidelity: Congruence of test conditions with actual Army tasks. *Proceedings of the 16th Annual Conference of the Military Testing Association*, 1974, 590-595.

The increasing movement towards performance-based, high-fidelity testing conflicts with the problem of reducing the cost and environmental impact of training and testing. Simulated approaches to testing for appropriate job tasks can meet the logical constraints imposed by full performance testing and also provide acceptable levels of predictive validity. This paper describes a general framework for the test fidelity problem, reviews the state of the art, and summarizes some research efforts currently in progress at the Army Research Institute.

Mager, R. L. *Measuring instructional intent*. Palo Alto, California: Fearon Publishers, 1974.

The importance that measures be relevant to what they are supposed to be measuring is stressed in this short book. Most difficulties arise when objectives show no performance and when items do not reveal which students can perform as desired.

Marine Corps Development and Education Command. Analysis of performance requirements (IAC 0202). Quantico, Va.: Instructor Training School, Educational Center, n.d.

"Analysis of Performance Requirements" provides a brief but systematic description of job analysis procedures. Techniques for subdividing jobs into duties and tasks for the development of performance measures are presented in a highly ordered fashion.

Osborn, W. C., Harris, J. H., & Ford, J. P. Functionally integrated performance testing. Proceedings of the 16th Annual Conference of the Military Testing Association, 1974, 582-589.

Because it preserves the initiating cues of the real work environment, the functionally integrated test should be able to claim a higher level of validity than more conventional performance tests. Further, the higher validity may not raise the cost of the performance test, since the functionally integrated test would require no more equipment than would tests on the separate tasks. Of course, in economy, it cannot compare with group administered paper-and-pencil tests or with ratings of job proficiency, but it should at least offer a highly relevant criterion against which they can be objectively validated.

Swezey, R. W., & Pearlstein, R. B. Developing criterion-referenced tests. Reston, Va.: Applied Science Associates, 1974.

This manual presents an overall procedure for developing and using criterion-referenced tests. Particularly helpful are the chapters on item format and level of fidelity. Process and product measures are discussed with suggestions for appropriate rating scales, as well as good examples of these scales.

Taylor, J. E., Michaels, E. R., & Brennan, M. F. The concepts of performance-oriented instruction used in developing the experimental volunteer Army training program (Technical Report 72-7). Alexandria, Va.: Human Resources Research Organization, March 1972.

This report describes the planning and implementing of the Experimental Volunteer Army Training Program (EVATP) at Fort Ord early in 1971. This was the Army's first effort to effect major training innovations in the conversion toward an all-volunteer Army. By the fall of 1971, this program was being used as a model for implementing the EVATP at other Army Training Centers. In developing the EVATP system, six established learning principles were applied to Basic Combat Training and Advanced Individual Training to modify the conventional training system. Course objectives and performance tests used were developed jointly by Fort Ord and HumRRO. In a comparison with a conventionally trained group, independently conducted by the Infantry School at Fort Benning, EVATP graduates performed significantly better on five out of seven BCT subjects, and seven out of nine AIT subjects. In general, these gains were shown by men at all levels of aptitude.

Thorndike, E. L. (Ed.). Educational measurement. Washington: American Council on Education, 1971.

The use of simulation is discussed in several articles. Particularly insightful is the article by Robert Fitzpatrick and Edward J. Morrison, "Performance and Product Evaluation," which explores simulation in terms of performance tests.

REFERENCES

PHASE I

Block I.4

There are no further references for Block I.4.

REFERENCES

PHASE I

Block I.5

Braby, R., Henry, J. M., Parrish, W. F., Jr., & Swope, W. M. *A technique for choosing cost-effective instructional delivery systems* (TAEG Report No. 16). Orlando, Fla.: Department of the Navy, Training Analysis and Evaluation Group, April 1975.

A major consideration in the choice of instructional setting is financial resources. The TECEP model offers training specialists a procedure for choosing instructional delivery systems appropriate to various types of military training.

Christal, R. E. The United States Air Force Occupational Research Project. In *The state of the art in occupational research and development*. Symposium presented at the Navy Personnel Research and Development Center, San Diego, Calif., July 10-12, 1973.

This project was designed to develop methodologies in job analysis (work performed by personnel); job evaluation (grade, pay, and skill levels); job structures (job engineering); job requirements; career development, personnel utilization, and job satisfaction.

Department of the Air Force. *On-the-job training* (AFM 50-23). Washington, D.C.: Headquarters, United States Air Force, July 1973.

This manual describes procedures for the planning, conducting, administering, and supervising of OJT programs designed to train technical personnel in a minimum amount of time. The dual-channel OJT program described is designed to provide trainees with career knowledge and job proficiency skills.

Department of the Army. *Trainer development program (TRADEP) progress report*. Fort Benning, Ga.: United States Army Infantry School, January 1975.

The TRADEP program presents a course of instructor training designed to be used with accompanying outside resources on the major training functions. The course covers needs assessment through course evaluation and quality control.

Deterline Associates. *Developing instructor-free instruction* (Task VI.B Report, Contract No. N61339-73-C-0150). Palo Alto, California: Deterline Associates, 1975.

The manual provides instruction on the development and writing of correspondence courses, STEP lessons, and how to convert existing courses to STEPs.

Gay, R. M. *Estimating the cost of on-the-job training in military occupations: A methodology and pilot study* (R-1351-ARPA). Santa Monica: The Rand Corporation, April 1974.

This report introduces a method of estimating (costing) on-the-job training costs and determinants of OJT in military occupations. Relationships between training costs and personal attributes of the trainee are discussed.

Haverland, E. *Transfer and use of training technology: A model for matching training approaches with training settings* (Interim Report). Alexandria, Va.: Human Resources Research Organization, October 1974.

A model which is designed to evaluate training approaches or innovations in relation to specific training settings is presented. The model allows the comparison of the characteristics of various training approaches with the corresponding characteristics of various training settings.

Joyce, R. P., Chenzoff, A. P., Mulligan, J. L., & Mallory, W. J. Fully proceduralized job performance aids: Handbook for JPA developers. Brooks Air Force Base, Texas: Air Force Systems Command, Human Resources Laboratory, December 1973.

Detailed instructions for the preparation of two major types of fully proceduralized JPAs are described: job guides and fully proceduralized troubleshooting aids. Instructions for performing the behavioral task analysis and for validation and verification of JPAs are discussed.

Stephenson, R. W., & Burkett, J. R. An action oriented review of the on-the-job training literature (AFHRL-TR-74-66). Brooks Air Force Base, Texas: Air Force Human Resources Laboratory, December 1974.

This is a review of civilian and military literature on OJT as well as all current Air Force regulations, manuals, and other documents governing or describing the OJT system. Innovations in training and their applicability to Air Force OJT programs are described.

GLOSSARY

ACRONYMS

AFS - Air Force Speciality

AR - Army Regulations

CMI - Computer Managed Instruction

CRT - Criterion Referenced Test

CODAP - Comprehensive Occupational Data Analysis Programs

DOS - Defense Occupational Specialities

FM - Field Manuals

FOJT - Formal On The Job Training

GED - General Educational Development

HQ - Headquarters

ISD - Instructional Systems Development

ISS - Installation Support School

ITV - Instructional Television

JPA - Job Performance Aids

JPM - Job Performance Measure

KOR - Knowledge of Results

LO - Learning Objective

LS - Learning Step

MODB - Military Occupational Data Bank

MOS - Military Occupational Specialities (Army/Marine Corps)

MWO - Modification Work Orders

NIH - Not Invented Here

NOTAP - Naval Occupational Task Analysis Program

OJT - On The Job Training

OSR - Occupational Survey Report

POI - Program of Instruction

QQPRI - Qualitative and Quantitative Personnel Requirements Identification

RS - Resident School

SME - Subject Matter Expert

SMP - System Master Plan

SOP - Standing Operation Procedures, Standard Operating Procedures

STEP - Self-Teaching Exportable Package

TAK - Trainer Appraisal Kit

TI - Traditional Instruction

GLOSSARY

ABILITY GROUPING: Arrangement whereby students are assigned to groups on the basis of aptitude testing.

ABSOLUTE STANDARDS: A statement defining the exact level of performance required of a student as a demonstration that he has mastered the course objective(s). Criterion-referenced tests are usually based on an absolute standard.

ACHIEVEMENT GROUPING: Arrangement whereby students are assigned to groups according to their performance on pretests of units of the course.

ACTION: Occurs in terminal learning objectives and learning objectives; describes the specific behavior the learner is to exhibit after training.

ACTION VERBS: Verbs that convey action and reflect the type of learning that is to occur. Action verbs must reflect behaviors that are measurable, observable, verifiable, and reliable.

ACTIVITY STEP: One simple operation or movement that comprises part of a job. A job performance standard consists of a list of these operations or movements.

ADJUNCT PROGRAMMING: A method of combining the features of good existing instructional materials (e.g., films, textbooks) with special directions or questions to guide the learner.

ADMINISTRATIVE CRITERIA: In media selection, the options that courseware be developed locally or at some central location.

ALGORITHM: A rule or procedure for accomplishing a task or solving a problem.

ALPHANUMERIC: Refers to a combination of letters and numbers; for example, on the keyboard of a teletype.

ALTERNATE PATH: Refers to elements which have relationships in which the specific situation encountered determines the appropriate sequence, or it may be another way of meeting the same objective.

TLO - Terminal Learning Objective

TM - Technical Manuals

TOE - Tables of Organization and Equipment

TRADOC - U.S. Training and Doctrine Command

BLOCKING: Refers to the process of defining and illustrating the different camera movements and camera shots in a television or film script. A blocked script may also contain directions as to the movement of actors as well as scenery changes.

CHECKLIST: Job performance aid which lists the elements of a task in the sequence of execution. The job holder places a check beside each element as it is accomplished, thus insuring that the task is completed.

CHRONOLOGICAL ORDER: Arranging content in order from one topic to another based on when they occurred in time.

COMMON-FACTOR LEARNING OBJECTIVES: Refers to learning objectives that are identical, or that have identical action words and similar objects of the action in the learning objective statement.

COMPARATIVE SEQUENCE: Sequencing which starts with familiar topics and goes to unfamiliar ones.

COMPLEXITY CRITERION: In media selection, the degree of complexity required of instructional materials in order to adequately train students to meet learning objectives.

COMPUTER MODELS TECHNIQUE: Occurs during the simulation of an operational system; involves having a computer simulate the major operations of the system, under a variety of conditions.

CONDITIONS: Occurs in terminal learning objectives; describes what is presented to the student in order to accomplish the specified action, that is, it describes the important aspects of the performance environment.

CONTIGUITY: Refers, in learning, to the principle that events which occur closely together become associated by the learner.

CONTINGENCY MANAGEMENT: The establishment of a set of procedures by which trainees are required to perform a certain amount of work or to achieve certain objectives before engaging in activities that are preferred by the trainee (e.g., recreation, a break, or a more desirable training event).

ASSESSMENT: A judgment of the effectiveness and efficiency of a training system, in terms of measurement and evaluation.

ASSOCIATION DEVICES: Memory aids, techniques which ease recall. Mnemonic devices.

ATTITUDE: A persisting state of a person that influences his choice of action.

ATTITUDE MEASURE: An instrument designed to gather information about how people feel toward a particular object. This could include liking or disliking subject matter, usefulness of a medium, or opinions about the medium.

AUDIO-ONLY PROGRAM: A production which does not contain any video or pictures; for example, a record or radio program.

AUDIO PRODUCER: Prepares tape recordings and produces audio programs. The audio producer combines narration, music, and other sound effects in the production of an audio program.

AUDIOVISUAL MEDIA: Refers to any device such as television or film which is both seen and heard.

BASELINE DATA: Valid and reliable information about the current level of performance of the intended student population. This data can be used to confirm the need to develop new instruction, or can be used as a comparison in ascertaining differences between students' performance before and after instruction.

BEHAVIORAL ATTRIBUTES: Qualities or activities that characterize an object or process. Behavioral attributes characterize each category of learning.

BLOCK SCHEDULING: Mode of instruction whereby all students receive the same instruction at the same time.

DECISION TREE: Flowchart; graphic representation of the sequence of a specific activity or operation.

DELIVERY SYSTEM: Any method containing plans and procedures for the presentation of instruction. Platform instruction, television, FOJT, and STEPs are all delivery systems.

DEPENDENT RELATIONSHIP: Occurs when skills and knowledges in one learning objective are closely related to those in the other learning objective. In order to master one of the learning objectives, it is first necessary to learn the other.

DOWNTIME: Refers to the period of time when equipment is inoperable.

DUTY: One of the major subdivisions of work performed by one individual. One or more duties constitute a job.

DUTY TITLE: Categorizes groups of tasks under identifiable headings to help in the organizing of lists of tasks.

EMPIRICALLY BASED REVISION: Revision based on the results of test data and the collection of other types of quantitative information.

ENTRY BEHAVIOR: The skill, knowledge, and/or attitude required before beginning a new segment of instruction; also may refer to the capability a person has prior to new learning.

ENTRY SKILLS: Specific, measurable behaviors that have been determined through the process of analysis of learning requirements to be basic to subsequent knowledge or skill in the course.

ENTRY SKILLS TEST: A measurement instrument designed to determine if a student already possesses certain skills or knowledge needed as a prerequisite before undertaking new instruction.

ENTRY TEST: Contains items based on the objectives that the intended students must have mastered in order to begin the course.

COURSE DOCUMENTATION: Information describing the current content of a course (instructional materials, tests, instructor's manual, evaluation plan, student's manual) and its developmental history (job analysis, criteria for selecting tasks for training, previous revisions).

CLUSTERING: A process of organizing many tasks into groups for the purpose of deciding upon the optimal instructional setting mix for that group of tasks.

CRITERION-REFERENCED TEST: Measures what an individual can do or knows, compared to what he must be able to do or must know in order to successfully perform a task. Here an individual's performance is compared to external criteria or performance standards which are derived from an analysis of what is required to do a particular task.

CRITICAL CUE: Cue which must be correctly interpreted by the student before we can correctly perform the associated task.

CRITICAL SEQUENCE: Sequencing of topics or objectives according to their importance.

CUE: A word or other signal that initiates or guides behavior; a prompt.

CUT-OFF SCORE: Minimum passing score.

DATA: Collection of facts or numerical values resulting from observations of situations, objects, or people.

DATA COLLECTION PLAN: An outline of the procedures and techniques that will be used to gather information for any specific purpose.

DATA RECORDING PLAN: Method of tabulating background responses and test data.

DECAY RATE: The amount of time it takes a trainee to forget what he has learned in school. If the decay rate is high then a trainee should not receive instruction in a specific task until shortly before he will actually perform it.

FOJT--FORMAL ON-THE-JOB TRAINING: This type of training takes place in the actual work situation.

FOLLOW-UP ACTIVITIES: The work events that occur after a course of instruction has been completed.

FORMATIVE EVALUATION: The iterative process of developing and improving instructional materials and procedures.

FIDELITY: Refers to how well the actions, conditions, cues, and standards of the JPM approximate those of the task.

FIELD USER NEEDS: The general and specific duties that will have to be taught to the trainee if he is to be able to adequately perform in a real world environment.

FIRST DRAFT MATERIALS: Any materials (book, film, etc.) which are not yet committed to their final form. First draft refers to the fact that the materials are still in 'rough' form and will be revised on the basis of test results and other data.

FLOWCHART: A graphic representation of the sequence of a specific activity or operation; decision tree.

FRONT END ANALYSIS: Refers to job analysis, selection of tasks for training, and development of JPMs.

FIXED SEQUENCE: Refers to elements that are always done in the same order.

GRAPHIC ARTIST: Designs and prepares a wide variety of visual illustrations such as graphs, charts, and diagrams.

GRAPHIC SCALE: Measurement device which includes some type of number line on which students indicate their attitude toward a social object.

GO NO-GO: Pass-fail; criterion of evaluation whereby student cannot be "partially correct". He is either 100% correct (go) or incorrect (no-go).

ERROR OF HALO: Occurs when an observer sometimes allows his rating of performance to be influenced by his general impression of a person.

ERRORS OF LOGIC: Occur when two or more traits are being rated. It is present if an observer tends to give similar ratings to traits which do not necessarily go together. The traits are related only in the mind of the person making the error.

ERRORS OF STANDARD: Occur when observers tend to rate performers too high or too low because of differences in their standards.

EVALUATION: The process of interpreting the results of measurement data (e.g., tests, JPMs) for the purpose of making a judgment or decision on the instruction or on the success of a trainee.

EVALUATION CRITERIA: The measures used to determine the adequacy of performance.

EVALUATION PLAN: A method or outline of what set of procedures will be used to gather data and information for the purpose of assessing a course of instruction.

EXTERNAL CUES: Signals for action that exist outside of the student (conditions, features, or characteristics of the job environment that trigger action).

FALSE NEGATIVE: Occurs when a person can perform the task but receives a failing score on the test.

FALSE POSITIVE: Occurs when a person cannot perform the task but receives a passing score on the test.

FEEDBACK: The return of information. Information on student performance is "fed" back to the student so that he can improve that performance; to the instructional designer so that he can improve materials and procedures on the basis of student needs; to the management system so it can monitor the internal and external integrity of the instruction and make appropriate revisions. Or, refers to the flow of data or information from one step in the ISD Model to others.

INSTRUCTIONAL MANAGEMENT PLAN: The specifications for the scheduling, instruction and evaluation of trainees toward the goal of course completion.

INSTRUCTIONAL PROGRAM: The development of various materials (books, audiovisual productions, etc.) designed to achieve a specific training goal.

INSTRUCTIONAL SETTING: The vehicle through which a trainee who initially is not able to perform a task becomes proficient in performing the task; for example, performance aids, self-teaching exportable packages, formal on-job training, installation support schools, and resident schools.

INSTRUCTIONAL SUPPORT: Learning resources; different kinds of material, number of instructors, amount of time, etc. which will contribute to the learning situation.

INSTRUCTIONAL SYSTEM: The total effort, distinct from the operating system by location, authority, or mission, that is concerned with the preparation of individuals to serve the operating system.

INTERNAL CUES: Internal biological signals that initiate or guide behavior.

INTERNAL EVALUATION: Assessment of the effectiveness of an instructional program in terms of student performance on stated terminal learning objectives.

JOB: The duties and tasks performed by a single worker constitute his job. If identical duties and tasks are performed by several individuals, they all hold the same job. The job is the basic unit used in carrying out the personnel actions of selection, training, classification, and assignment.

JOB ANALYSIS: The basic method used to obtain a detailed listings of duites, tasks, and elements necessary to perform a clearly defined, specific job, involving observations of workers and conversations with those who know the job, in order to describe in detail the work involved, including conditions and standards.

GROUP MANAGEMENT PLAN: Arrangement whereby instruction is scheduled and conducted for groups instead of individuals.

GROUP TRAINING: A group of people gathered together for the purpose of receiving information or instruction in the performance of some specific task.

HARD DATA: A direct and precise measure of a specific performance. A JPM is an example of hard data while an attitude questionnaire is a less direct measure, providing soft data.

HIGH DENSITY SIGNAL: A signal containing many cues. A low density signal contains few cues.

INDEPENDENT RELATIONSHIP: Occurs when skills and knowledges in one objective are unrelated to those in the other objective. Mastering one of the objectives does not simplify the other.

INDICATOR BEHAVIOR: Refers to that behavior that indicates the presence of a specific attitude.

INDIVIDUALIZED INSTRUCTION: Refers, in the ISD Model, to a management scheme which permits individual characteristics of trainees to be a major determinant of the kind and amount of instruction given. Here, it nearly always implies some form of self-pacing.

INSTALLATION SUPPORT SCHOOLS: Organized and operated by individual units or commands to meet local training requirements.

INSTRUCTIONAL CONDITIONS: The amount of participation which the instruction requires of the learner. Instructional conditions may be active (the learner produces or practices) or passive (the learner sits and listens).

INSTRUCTIONAL DESIGNER: Person who designs and develops a program or course of studies based on a systematic analysis.

INFORMATION: Knowledge; the facts, names, labels, and larger bodies of knowledge that are necessary for successful job performance.

LEARNING GUIDELINES: Statements which specify the learning events and activities appropriate to specific instruction. Learning guidelines combine to form learning sub-categories.

LEARNING HIERARCHY: Graphically portrays the relationships among learning tasks in which some tasks must be mastered before others can be learned.

LEARNING OBJECTIVE: Describes precisely what is to be learned in terms of the expected student performance under specified conditions to accepted standards. These learning objectives identify the mental skills, information, attitudes, or physical skills that are required to perform the terminal learning objective.

LEARNING RESOURCE CENTER: Library containing instructional materials and areas for viewing and study.

LEARNING STEP: Occurs when learning objectives are broken down into smaller parts.

LEARNING SUB-CATEGORY: A division of a learning category.

LEARNING TASK ANALYSIS: Procedure used in the domain of intellectual skills to identify prerequisite tasks that must be learned before a person can learn a given task.

LINK TRAINER: Mechanical training device which simulates the cockpit of an aircraft.

RESPONSE BIAS: Tendency to favor a certain response over others.

MANAGEMENT PLAN: Program for the assignment, monitoring, and assessment of the personnel, materials, and resources dedicated to a specific mission, operation, or function.

MASTERY: In terms of learning, refers to meeting all of the specified minimum requirements for a specific performance. Criteria for mastery are defined in the design phase of the ISD Model.

JOB FIDELITY: The degree to which a testing situation truthfully and accurately reflects the job situation.

JOB PERFORMANCE MEASURES: Tests that are used to evaluate proficiency of a job holder on each task he performs.

JOB PERFORMANCE TEST: Test used to determine whether or how well an individual can perform a job. In may include either all of the job performance measures for a particular job or a subset of the job performance measures.

JPA--JOB PERFORMANCE AID: A checklist, instruction sheet, or other device that offers a possible alternative to training rather than an actual method of training; they are developed to eliminate or minimize training requirements for some tasks.

KNOWLEDGE OF RESULTS: Feedback; information provided to the student indicating the correctness of his response. Evaluative knowledge of results indicates what a student is doing right and what he is doing wrong. Comparative knowledge of results indicates how the student's response compares to the objective or standard established by the instructor.

LEARNER CHARACTERICTICS: The traits possessed by learners that could affect their ability to learn (e.g., age, I.Q., reading level, etc.).

LEARNING ACTIVITY: The specific behaviors a student performs during a particular episode of learning.

LEARNING ANALYSIS: A procedure to identify subelements that must be learned before a person can achieve mastery of the performance.

LEARNING CATEGORY: A division of learning behavior. All learning may be classified into one of four learning categories: mental skill, physical skill, information, or attitude.

LEARNING EVENT: The immediate outcome of a learning activity.

MNEMONICS: Methods which make information easier to remember; memory aids.

MODE OF INSTRUCTION: Method of scheduling materials presentation. The instructional mode may be individualized (self-pacing) or group (block scheduling).

MODULE: An individualized self-instructional package usually containing all the necessary materials a learner needs to meet some or part of a terminal learning objective.

MULTIMEDIA PACKAGE: Self-contained instructional unit in more than one medium.

NARRATION: Is the voice overheard on an audiovisual program.

NARRATOR: Is the person whose voice is heard describing or commenting upon the content of a film, television program, etc.

NUMERICAL SCALE: Measurement device which associates verbal descriptions of social objects with numbers and requires students to indicate their attitudes by marking the appropriate number.

OBSERVATION INTERVIEW: Job holder is observed in the job environment performing all or a substantial part of the job; the job holder performs the job while the analyst ask questions.

OFF-LINE: Refers to any activity which does not take place as part of the regular production process.

OVERLEARNING: Refers to the continual practice on a learning task by a person who has correctly performed the task.

PEER TUTORING: A form of instruction in which students at the same or more advanced level of knowledge provide instruction to students at the same or lower level of knowledge on the specific objectives under consideration. Peer tutors are not members of the existing instructional establishment.

MEAN: Arithmetic average calculated by adding up all scores and dividing by the number of scores.

MEASUREMENT: Consists of rules for assigning numbers to objects to represent quantities of attributes.

MEASUREMENT ERRORS: Incorrect procedures carried out during the measurement process which invalidate the results. These errors result from unfounded assumtions made by judges or raters.

MEASUREMENT PROCESS: The operations involved in determining the amount of an attribute (e.g., skill, knowledge, or attitude) possessed by a student.

MEDIA: Means for presenting instructional material to learners; for example, books, audiotapes, and filmstrips.

MEDIA ALTERNATIVE: A form of instructional material that contains the stimulus criteria required by a specific learning activity.

MEDIA MIX: Combination of different media used to present a unit of instruction.

MEDIA POOL: All of the media options suitable for a given unit of instruction. The final media choice is drawn from the media pool.

MEDIA SELECTION: Is the major means of determining how instruction is to be packaged and presented to the student.

MENTAL SET: A preparatory mental adjustment, or readiness, for a particular type of experience.

MENTAL SKILLS: Those processes of identifying, classifying, using rules, and solving problems that involve active mental processing. Mental skills imply the capability of applying the learning to some situation and demonstrating the mental skill, such as thinking, creating, and analyzing.

PROCESS STANDARDS: Refers to the conditions which must be satisfied for a job to be successfully completed. Process standards refer to sequence, accuracy, speed of performance, and completeness.

PROGRAMMED INSTRUCTION: Instructional materials which present subject matter in a series of small sequential units which require responses from the student.

PROMPT: A word or other signal that initiates or guides behavior; a cue.

QUALITY CONTROL: Process of measuring and evaluating in order to maintain course standards through adjustments in instructional materials or procedures.

QUALITY CONTROL DATA: Information which reflects the degree of success achieved by a system or operation.

RANDOM SELECTION: Choosing people or objects at random rather than according to some systematic plan.

RANK ORDER: The assignment of ranks to students. This could refer to groups, such as the top 10%, or simply listing each student from highest to lowest. Rank ordering is appropriate when there is a need to select the fastest, the most accurate, or the best producer.

RATING ERRORS: Errors of standards, ratio, and logic.

RATING SCALE: A measurement device in which a student must choose a response from a range of choices arranged in a continuum from low to high or good to bad, etc.

REGULATIONS: Rules for appropriate conduct and behavior.

RELIABILITY: The consistency with which a test measures the amount of student achievement.

RESIDENT SCHOOLS: These schools are designed to meet service-wide training requirements.

PERFORMANCE EVALUATION: The gathering of data to specifically determine the success of students on a specific task, as a result of a training program.

PERFORMANCE MEASURES: The absolute standard by which a job performance is judged. A performance measure is the inventory of job tasks with each performance objective.

PERSEVERATE: Continue an activity until it is completed, regardless of the difficulty, or the appropriateness of the solution technique to the problem.

PERT--PROGRAM EVALUATION REVIEW TECHNIQUE: PERT is a method of monitoring the flow of a large project by breaking it down into small individual activities and assigning each activity a specified amount of time for completion.

PHYSICAL SKILLS: Specified muscular activities for accomplishing a goal.

POST FEEDBACK DELAY: The pause which follows the presentation of feedback. This allows time for the correct response to "sink in."

POSTTEST: A test administered after the completion of instruction to assess whether a student has mastered the objectives of the course or unit.

PREDICTIVE VALIDITY: The ability of a test score to accurately forecast future performance.

PREDIFFERENTIATION OF STIMULI: Pointing out the distinguishing features of an object and explaining the differences between them.

PRETEST: Administered prior to instruction to determine how much the student already knows.

PROCESS EVALUATION: An early stage in ISD development that identifies which steps in the model will be used for the course under development. The purpose of the process evaluation is to describe and document the actual developmental process for this particular instruction.

SIMULATION: Any change from reality or any imitation of reality. Three types are common: simulating part of the system, simulating the operation of the system, and simulating the environment in which the system will operate.

SIMULATORS: Machines or processes designed to provide training which will have high positive transfer to the real world equipment or situation. Simulators are ordinarily cheaper, safer, or more available than the actual situation or equipment.

SLIDE-TAPE: A combination of visual slides and an audio tape synchronized so that the audio describes the content of the slides.

SOFT DATA: Obtained from attitude or opinion surveys. This data is not as reliable as hard data.

STANDARDS: Occurs in terminal learning objectives or learning objectives; describes the criterion or standard of performance which must be attained.

STIMULUS CRITERIA: Those basic qualities or capabilities of a medium that are required to carry out the intent of the learning activity; for example, visual images, motion, color, and sound.

STORYBOARD: A collection or series of small pictures which describe the action and content that will be contained in an audio-visual or visual-only production. A sequence of these small pictures comprise a storyboard.

SUBJECT MATTER EXPERT: A person who has professional skill in the performance of some job and who is consulted by an instructional designer in the process of job task analysis.

SUPPORTIVE RELATIONSHIP: Occurs when skills and knowledges in one objective have some relationship to those in the other objective; the learning involved in mastery of one learning objective transfers to the other, making learning involved in the mastery of the other easier.

REVISION PLAN: A detailed outline of the procedures to be taken to modify the structure or content of a course.

REWARD SEQUENCE: Scheduling the more pleasant activity to follow the less pleasant activity; can be used to provide a reward for completion.

SAMPLE: A portion or small segment of the students for whom instruction is designed.

SAMPLING PLAN: Procedure for selecting a small but representative group from a larger population.

SCALE: In media selection, some materials must represent actual objects and accurately represent the dimensions of those objects. A model may, for example, be full scale, half scale, or on a 1 to 10 scale with the actual object.

SELF PACING: Mode of instruction whereby each student works through the instructional materials at his own rate of speed.

SELF-PACED MANAGEMENT PLAN: Arrangement whereby instruction is scheduled and conducted for individual students rather than groups of students.

SELF-TEACHING EXPORTABLE PACKAGES: Self instructional study units; generally sent to the student wherever he is stationed.

SEQUENCING: Ordering instruction; proper sequencing allows the learner to make the transition from one skill or body of knowledge to another, and assures that supporting skills and knowledge are acquired before dependent performances are introduced.

SHAPING: Gradually changing a student's behavior until it is correct.

SIGNAL: Cue that initiates and directs activity.

TASK STATEMENT: A statement of highly specific action which has a verb and object; for example, sort mail.

TECHNICAL ORDERS: Military regulations which deal with the specific nature of technical materials and equipment.

TERMINAL LEARNING OBJECTIVE: Derived from job performance measures, TLOs are to be attained during training. TLOs are broken down into their component parts which are documented as learning objectives which may be further divided into learning steps. Each TLO contains actions, conditions, and standards.

TESTS: Any device or technique used to measure the performance of a student on a specific task or subject matter.

TESTING CONSTRAINTS: Limitations such as time, money, personnel, facilities, and other resources, which prohibit job performance measures from being identical to the tasks they measure.

TRADE-OFFS: In any systematic approach to instruction, it is necessary to make compromises between what is desirable and what is possible. Ordinarily, these decisions involve increases or decreases in time, money, facilities, equipment, or personnel. Training aids and simulators represent examples of trade-offs.

TRAINER APPRAISAL KIT: A package of instructional materials designed to provide a course instructor with practice in the preparation, presentation, and validation of instruction.

TRAINING: The teaching of job skills. It can take a number of forms such as self-teaching exportable packages, training manuals, individual learning packages, FOJT, or group training.

TRAINING SETTING CRITERIA: In media selection, the options that training must be either small group, large group, individualized at a fixed location, or individualized independent of location.

SYMBOL: Anything that stands for or represents something else. A plus sign (+) is a symbol for the mathematical operation of addition.

SYSTEM MASTER PLAN: Control document used to coordinate the development and implementation of an instructional program.

SYNCHRONIZING PULSE: An audible or inaudible sound used to coordinate the audio and video portions of a slide-tape program so that audio and video (i.e., slide and narration) are coordinated.

SYSTEMS APPROACH: A generic term referring to the orderly process of analysis, design, development, evaluation, revision, and operation of a collection of interrelated elements.

TALK-THROUGH TECHNIQUE: Occurs during the simulation of an operational system; involves talking through each operation in the new system to determine decisions and contingencies.

TARGET POPULATION: The pool of potential entrants to training for which instructional materials are designed and tried out.

TASK DELAY TOLERANCE: A measure of how much delay can be tolerated between the time the need for task performance becomes evident and the time actual performance must begin.

TASK: Formed in clusters which make up duties. A task is the lowest level of behavior in a job that describes the performance of a meaningful function in the job under consideration.

TASK INVENTORY: List that itemizes all of the tasks that make up a selected duty.

TASK LEARNING DIFFICULTY: Refers to time, effort, and assistance required by a student to achieve performance proficiency.

TASK STANDARD: A statement of how well a task must be performed.

TRYOUT: Practice test; the purpose is to make the tryout as realistic as possible by eliminating as many sources of unreliability as possible.

UNDERTRAIN: Provide inadequate training that does not prepare a student to meet regular job performance requirements.

VALIDATION: A process through which a course is revised until it is effective in realizing its instructional goal.

VALIDATION DOCUMENTATION: A report which describes in detail how a specific course of instruction was validated and for what target population.

VALIDATION PROCESS: Testing instructional materials on a sample of the target population to insure that the materials are effective.

VALIDITY: The degree to which a test measures what it claims to measure.

VALUE ENGINEERING: Refers to the process of designing equipment or instruction to meet but not exceed the required outcomes. Ordinarily, it refers to the elimination of features or instructional objectives that have not been demonstrated to be positively necessary.

VIGILANCE LEVEL: General degree of watchfulness or attentiveness to what may come.

VISUAL FORM: In media selection, refers to whether alphanumeric or pictorial characteristics are required in a learning situation.

VISUAL SPECTRUM: The type of color required of instructional materials. Some must be with full color, others may be with black and white or shades of grey.

WITHIN-COURSE TESTS: Administered during a course of instruction to assure that all students are "keeping up" with the learning objectives.

WORK ELEMENTS: The element is the smallest component in the structure of a job. Elements combine to form a task, tasks combine to form a duty, and duties combine to form a job.

INDEX

INDEX

NOTE: The Roman numerals following each entry refer to the Phase numbers; the Arabic numerals refer to the page numbers.

Ability grouping, III: 125
Achievement grouping, III: 125
Activities, see Learning activities
Adjunct programs, III: 251
Affective component: attitude learning, III: 66-67, 103
Air Force Specialties (AFS), I: 3,8
Algorithms, III: 20-22, 71-104
Antisubmarine warfare (ASW) training program, Navy, III: 142
Attitude learning: learning sub-category 11, III: 66-70, 103-104
  affective component, III: 66-67, 103
  behavioral component, III: 66, 70, 104
  cognitive component, III: 66, 67-70, 104
Audio producer (production personnel), III: 228
Audio-visual production, III: 235-244

Baseline data collection, V: 25-26, 70-71
Behavioral component: attitude learning, III: 66, 70, 104
Block scheduling (group instruction plan), III: 124-125

Classifying: learning sub-category 2, III: 38-40, 74-75
Clustering, task, I: 244-245
Cognitive component: attitude learning, III: 66, 67-70, 104
Command Job Analysis, schedule for, I: 58
Common-factor learning objectives, II: 90-92
Comprehensive Occupational Data Analysis Program (CODAP), I: 121
Computer-assisted instruction (CAI), III: 191
Computer-managed instruction, III: 191-194
Conditions, JPM, I: 177-178
  on-the-job, task, I: 24-26, 89-93
Contiguity, III: 41
Contingency-managed instruction, III: 187-189, 215
Contract, student (or performance), III: 189
Cues, JPM, I: 179
  prompts for student learning, III: 6-8
  task, I: 25, 27-28

Data collection,
  for external evaluation, V: 68-77
  for internal evaluation, V: 1-8, 29-46, 53-62
  for JPMs, I:45-46
  for rating tasks, I: 133-139
Data collection plan for job analysis,
  alternate or short-cut, I: 47, 77-78
  form preparation, I: 49-51, 59
  group interviews, I: 40
  individual and observation interviews, I: 36-37, 41-46, 52-62
  jury-of-experts, I: 39-40
  questionnaire survey, I: 37-39, 45, 46, 68-73
Decision-making: learning sub-category 5, III: 46-48, 83-86
Decisions, management, Executive Summary: 20, 24-25, 30-32, 36-37, 42-43, 51, 54-55, 59, 63, 69-70, 75-76, 81-82, 85-86, 91-92, 96-97, 100-101, 108-109, 114-115, 119-120
Decision trees, see Algorithms
Defense Occupational Specialties (DOS), I: 3, 8, 214
Delay tolerance, see Task delay ...

Delivery system, III: 213-214, *see also* Media *and* Instructional management plan and delivery system
Detecting: learning sub-category 4, III: 43-45, 78-82
Duty, I: 11-12

Electronic technician (production personnel), III: 229
Element(s), I: 17-22
  alternate-path, I: 22-24
  fixed-sequence, I: 22-24
Entry behavior, student, II: 62-77
  definition of, II: 62-63
  entry tests for, II: 70-72
  outputs, II: 76
  procedures for determining, II: 64-75
  purpose of establishing, II: 62-63
  pretesting, II: 62, 73-75
  remedial or preparatory instruction, II: 69
  revise/test procedure, II: 69
  tests to verify assumptions about, II: 63-69
Entry test, development of, II: 72
  need for, II: 70-72
Equipment-oriented jobs, I: 81-83
Errors in measuring and testing, I: 201-205; IV: 33
  of halo, I: 203-204; IV: 33
  of logic, I: 204-205
  of standard, I: 202; IV: 33
Evaluation, external, *see* External evaluation
Evaluation, internal, *see* Internal evaluation
Existing courses, analysis of, I: 213-229
  development documentation for, I: 220
  evaluating existing job analyses for, I: 215-216, 221-222
  evaluating existing Job Performance Measures for, I: 216, 225-226
  evaluating tasks, I: 223-224
  evaluating validation documentation for, I: 226
  Front End Analysis, I: 216-218
Existing courses (*continued*)
  outputs, I: 218, 227-228
  procedures for, I: 218-227
  rationale for, I: 213, 215
  revisions indicated by, I: 227
Existing materials, review of, III: 198-220
  collection process for, III: 202-203
  modifications determined by, III: 206-208, 212-213, 216
  outputs, III: 216-217
  procedures for, III: 201-216
  rationale for, III: 198-201
  with reference to delivery system, III: 213-214
  with reference to learner characteristics, III: 203-205
  with reference to learning guidelines, III: 208-213
  with reference to management plan, III: 214-215
External evaluation, V: 63-86
  baseline data collection, V: 70-71
  data collection methods, V: 68-69
  data collection procedures, V: 69-77
  data consolidation, V: 78-81
  data requirements, V: 66-68
  data sources, V: 65-66
  documentation, V: 84-85
  job performance evaluation data collection, V: 71-73
  outputs, V: 83-85
  personal interview data, V: 74-75
  planning phase, V: 65-69
  procedures, V: 65-83
  purposes of, V: 63-65
  questionnaire use, V: 73-74
  recommendations, V: 81-83
  records of students' performance during instruction, V: 76-77
  report (EXER), V: 78, 83
  time considerations, V: 68
External Evaluation Report (EXER), V: 78, 83, 90-91, 93, 95-96, 105, 109-110, 112

Feedback, III: 6, 9-10
Formal On-the-Job Training (FOJT), I: 231, 237-238, 256-258; III: 139-141, 260-262

- Formative evaluation, III: 280-281
- Front End Analysis, I: 216-218

- Graphic artist (production personnel), III: 227-228

- Hard data, V: 4

- Identifying symbols, learning subcategory 3, III: 41-42, 76-77
- Installation Support Schools (ISS), I: 238, 258-259; III: 140-142
- Instruction, conducting, IV: 29-39
  - course documentation, pre-instruction review of, IV: 32-34
  - changes in, IV: 36-38
  - documentation of changes, problems for, IV: 35-37
  - follow-up activities, IV: 37-38
  - function of instructor, IV: 29-31, 32-38
  - outputs, IV: 38
  - procedures, IV: 32-38
  - test administration, IV: 32-33, 34-35
  - training of instructors, IV: 34-35
- Instruction, development of, III: 221-287
  - adjunct programs, III: 251
  - aims, III: 221-223
  - audio-only script guidelines, III: 230-232, 233
  - audio-visual production, III: 235-244
  - Formal On-the-Job Training (FOJT), III: 260-262
  - Instructor's Guide, III: 265-266
  - Job Performance Aids (JPAs), III: 252-260
  - needs and constraints, III: 224-225
  - outputs, III: 270
  - platform lectures, III: 248
  - pre-testing of draft materials, III: 263-265
  - printed materials, III: 246
- Instruction, development of (continued)
  - procedures, III: 224-269
  - production personnel, III: 227-229
  - programmed instruction, III: 246-247
  - resources, III: 225-230
  - Self-Teaching Exportable Packages (STEPs), III: 248-249
  - slide-tape production, III: 239-244
  - Students' Guide, III: 269
  - supplementary instruction, III: 249-250
  - television program production, III: 244-246
  - terms defined, III: 286-287
  - types of instruction, III: 230-263
  - user instructions, III: 265
  - video-only materials, III: 232, 234-235
- Instructional management plan and delivery system, III: 105-197
  - block-scheduling for group instruction, III: 124-125
  - consumables and courseware, III: 136-137
  - course management, III: 126-127
  - definition, III: 105
  - equipment and facilities, III: 135-136
  - for instructors, III: 131-135
  - for student processing, III: 127-130
  - for support personnel, III: 135
  - function of guidelines, III: 106-107
  - group assignment, methods of, III: 125
  - management guidelines, III: 124-137
  - media costs, III: 112
  - media mixes, III: 107-118
  - media selection, III: 118-124
  - outputs, III: 142-143
  - procedures for specifying, III: 107-142
  - program completion, III: 131
  - self-pacing mode, III: 124, 125-126
  - System Master Plan (SMP), III: 105, 107, 138-142

Instructional management plan, implementation of, IV: 1-18
  equipment, IV: 15
  instructor's manual, reviewed and supplemented, IV: 4-5
  materials, IV: 15
  procedures, IV: 4-15
  space allocation, IV: 14-15
  staff training, IV: 7-12
  student selection, IV: 13
  student manuals, reviewed and supplemented, IV: 6
  time allocation, IV: 14
  time relationships within ISD process, IV: 3-4
  Trainer Appraisal Kit (TAK), IV: 7-12
Instructional materials, validation of, III: 280-346
  attitude measures, III: 288, 294-295
  data analysis plan, III: 295-297, 316
  data collection and recording system, III: 287-293, 314-316
  data consolidating and analyzing, III: 304-308, 331
  group trial, administering, III: 328
  group trial procedures, III: 316-317
  individual trials, plan for conducting instruction for, III: 297-298
  individual trials, steps in conducting, III: 298-303
  learning objective rating, III: 317-327
  nature and purpose of, III: 280-285
  outputs, III: 336-339
  participant selection for group trials, III: 317, 328
  plan for group trials, III: 312-328
  plan for individual trials, III: 285-298
  platform instruction, III: 329-331
  procedures, III: 285-336
  revision of attitude measures, III: 316
Instructional materials, validation of, (continued)
  revision requirements, III: 308-311, 332-336
  standards and constraints for group trials, III: 313-314
Instructional methods and devices, III: 163-172
  audio-only systems, III: 163
  audio-visual systems, III: 163-166
  computer simulation, III: 166-168
  print materials, III: 169-171
  special and non-standard items, III: 171-172
  visual-only systems, III: 168-169
Instructional setting(s), selection of, I: 230-264
  assignment of tasks, I: 233-263
  clustering tasks, I: 244-245
  cost analysis for, I: 240-242
  definition of instructional setting, I: 230-231
  documentation for, I: 262-263
  Formal On-the-Job Training (FOJT), I: 231, 237-238, 256-258
  group training, I: 239
  inputs, I: 231-232
  Installation Support Schools (ISS), I: 231, 238, 258-259
  Job Performance Aids (JPAs), I: 231, 233-235, 236, 242, 245-249
  Job Performance Measures in, I: 232
  outputs, I: 262-263
  personnel data factor in, I: 249-250
  procedures, I: 242-263
  Resident Schools (RS), I: 231, 238-239, 259
  revision of task assignments, I: 260-262
  Self-Teaching Exportable Packages (STEPs), I: 231, 235, 237, 250-255
  work experience, I: 239-240
Instructional Systems Development (ISD) program, documentation for, I: 83-84, 87
  initiation of, I: 1-5
  purpose of, I: 2, 214
  rationale for sequence of, I: 5-6
Instructional television (ITV), III: 194-195

Instructor evaluation program, IV: 7-8
Instructor-managed instruction, III: 186-187
Instructor(s), role of, IV: 7-9, 29-31, 35-38
  training of, IV: 7-12
Instructor's Guide, III: 265-268
Instructor's Manual, IV: 4-5
Internal evaluation, IV: 2-4, 5, 9; V: 1-62
  conducting process, V: 33-34
  data forms and questionnaires (examples), V: 53-62
  data rating and measurement, V: 1-8
  data (general) display and interpretation, V: 34-40
  data sources and uses, V: 5-8
  documentation, V: 49-52
  evaluation designs (additional), V: 46-49
  functions and requirements of, V: 1-10
  ISD documentation for process evaluation, V: 17-19
  outputs, V: 49
  performance data display and interpretation, V: 40-46
  Performance Evaluation Plan, V: 22-28
  Plan for Collecting Information from Instructors, V: 31-33
  Plan for Collecting Information from Students, V: 29-30
  plan (overall) development, V: 11-33
  procedures, V: 11-49
  Process Evaluation Plan, V: 14-22
  product evaluation, V: 20
  Program Evaluation Review Technique (PERT), V: 10
  Progress Evaluation Plan, V: 11-14
  project schedule, V: 10
  report (INER), V: 34, 49
  sample summary of internal evaluation report, V: 50
Internal Evaluation Report (INER), V: 34, 49, 90, 93, 95, 105
Interview(s) for data collection, arrangements for, IV: 54
Interview(s), (continued)
  briefings preceding, I: [illegible]-57
  criteria for interviewee selection, I: 52-54, 59
  for external evaluation, V: 74-75
  forms, I: 49-51, 59, 134-136
  group, I: 40
  guidelines for conducting, I: 59-61
  individual, on-site, observation, I: 36-37, 41-46, 52-54
  schedule for conducting, I: 58

Job, I: 8
Job analysis, I: 1-112
  daily schedule for, I: 58
  data collection, I: 34, 36-78
  data revision, I: 74-76
  documentation for, I: 83-85
  functions of, I: 2, 5
  interviews for, I: 36-37, 40-46, 52-61
  job analysts (personnel), I: 48-49
  of equipment-oriented jobs, I: 81-83
  of new jobs, I: 41, 78-83
  of non-equipment-oriented jobs, I: 80-81
  outputs, I: 33-34, 85
  overview of, I: 33-34
  procedures, I: 34-83
  questionnaire surveys for, I: 37-39, 44-46, 68-73
  task inventory validating, I: 68
  task inventory verifying, I: 66-67
  terms defined, I: 6-33
Job data worksheets, samples, I: 51, 63-65, 192-193, 210
Job Performance Aids (JPAs), I: 18, 114, 231, 233-235, 245-249; III: 139, 252-260
Job performance evaluation data collection, V: 71-73
Job Performance Measures (JPMs),
  in analyzing existing courses, I: 216, 225-226
  in developing learning objectives, II: 2, 6
  in external evaluation, V: 70-73, 80
  in internal evaluation, V: 43

Objectives, development of (continued)
  terminal learning objectives (TLOs) preparation, II: 2-5, 6-16

Peer-managed instruction, III: 190-191, 215
Perceptual set(s), III: 46, 63
Performance Evaluation Plan, V: 22-28
  area of "entry skills," V: 24-25
  area of "external requirements," V: 23-24
  area of "tests," V: 25-26
  area of "time required to complete instructional units," V: 27-28
Performing gross motor skills: learning sub-category 7, III: 53-55, 91-93
Photographer (production personnel), III: 228
Physical fidelity, of Job Performance Measures, I: 161-163, 167
Platform lectures, III: 248
Positioning movement and recalling procedures: learning sub-category 9, III: 58-62, 96-99
Post-feedback delay, III: 61
Posttest, V: 109-110
Predictive validity of Job Performance Measures, I: 158-161, 167
Predifferentiation of stimuli, III: 38, 41, 49
Pretest, II: 73-75
Print specialist (production personnel), III: 228
Process Evaluation Plan, V: 14-22
Process rating, I: 196
Product rating, I: 195
Program Evaluation Review Technique (PERT), V: 10
Programmed instruction, III: 246-247
Progress Evaluation Plan, V: 11-14

Questionnaire survey, administration of, I: 72-73, 106-112
Questionnaire survey (continued)
  closed form, I: 38-39
  for external evaluation data collection, V: 73-74
  for job analysis, I: 37-39, 44-46
  for rating tasks for training, I: 133-136
  open form, I: 38-39
  preparation of, I: 68-71, 134-136
  sample selection for, I: 71-72, 133-134

Random grouping, III: 125
Rank-order testing, II: 52-55
Ratings (Navy), I: 3, 8
Rating scales (for Job Performance Measures), description of, I: 197-198
  graphic, I: 198-200
  numerical, I: 197
Recalling bodies of knowledge: learning sub-category 6, III: 49-52, 87-90
Reinforcement; reinforcer, III: 187-189
Resident Schools (RS), I: 238-239, 259; III: 139-141
Response biases, III: 46
Revision of system, *see* System revision
Revision plan format, V: 113
Rule-learning and using: learning sub-category 1, III: 35-37, 71-73

Sampling plan for Job Performance Measures, I: 187-191
Self-pacing instructional plan, III: 124, 125-126
Self-Teaching Exportable Packages (STEPs), I: 231, 235-237, 250-255; III: 140-142, 248-249
Sequence and structure of learning objectives, determing, II: 79-96
  common-factor learning objectives, II: 90-92
  determining relationships, II: 81-82, 83
  grouping, II: 92-94

- Sequence and structure of learning objectives, determining (*continued*)
  - outputs, II: 94
  - procedures. II: 81-93
  - purposes of, II: 79-80, 88-89
  - with dependent relationships, II: 82-87
  - with independent relationships, II: 90
  - with supportive relationships, II: 87-88
- Setting, *see* Instructional setting, selection of
- Shaping, III: 55, 57
- Simulator requirements in Job Performance Measures, I: 163, 172-176
- Slide-tape production, III: 239-244
- Soft data, V: 4
- Source materials, of job analysis data and job information, I: 97-98
  - of training courses and instructional materials, I: 95-97
- Staff training, instructional, IV: 7-12
- Standards, Job Performance Measures, I: 180-184
  - task, I: 28-33
  - terminal learning objective test, II: 47-50
  - training, II: 47-50
- State-of-the-art, III: 120
- Steering and guiding: learning sub-category 8, III: 56-57, 94-95
- Stimulus criteria (media), III: 107-108
- Storyboards, III: 234, 239-242, 245-246
- Student management plans, *see* Management plans, student *and* Instructional management plan
- Student self-managed instruction, III: 195, 215
- Students' Guide, III: 269
- Students' manual, IV: 6
- Subject Matter Experts (SMEs), I: 79, 81-82, 133
- Supplementary instruction, III: 240-250
- System Master Plan (SMP), III: 105, 107, 138-142; V: 10, 90-91
- System revision, V: 87-120
  - based on changes in doctrine or content of DOS, V: 94
  - based on efficiency of instruction, V: 96-103
  - based on External Evaluation Report, V: 95-96
  - based on Internal Evaluation Report, V: 95
  - description of, V: 87-89
  - follow-up activity, V: 115
  - for improvement of instructional effectiveness, V: 109-112
  - for operating instruction, V: 105-106
  - for time reduction, V: 106-109
  - guidelines for determining revision needs, V: 103-112
  - outputs, V: 115-116
  - preparation of revision plan, V: 112-114
  - priority ratings for, V: 92
  - procedures for, V: 93-115
  - purposes of, V: 87-90, 93
  - sources for, V: 90-91

- Task(s), I: 12
  - checklist task inventory, I: 152-154
  - clustering of, I: 244-245
  - conditions statement for, I: 24-26, 89-93
  - delay tolerance, I: 123-125, 246
  - guidelines for diagramming, I: 24
  - inventory, verifying and validating, I: 66-68
  - Job Performance Measures for, I: 157-211
  - multiple, I: 164-165
  - statements, I: 13-17, 61
  - unitary, I: 164
  - validated task list, sample, I: 33, 86
- Task selection, I: 113-155
  - criteria for, I: 118-133, 152-154

- Job Performance Measures (*continued*)
  - in selecting instructional settings, I: 232, 242
  - in system revision, V: 110-111
  - in testing, II: 44
- Job Performance Measures, construction of, I: 156-212
  - checklists for, I: 196-197, 211
  - conditions, I: 177-178
  - cues, I: 179
  - cut-off scores for, I: 200-201
  - data collection for, I: 45, 46
  - documentation for, I: 191-193, 209
  - errors in measurement, I: 201-205
  - outputs, I: 209
  - part-task testing, I: 185-187
  - physical fidelity, I: 161-163, 167
  - predictive validity, I: 158-161, 167
  - procedures for, I: 165-209
  - process and product rating, I: 170-171, 195-196
  - rationale for, I: 156-157
  - rating scales for, I: 197-200
  - sample list of validated JPMs, I: 210
  - sampling plan, I: 187-191
  - scoring procedures, I: 191, 194-204
  - simulator requirements for, I: 163, 172-176
  - standards, I: 180-184
  - testing constraints, I: 166-170
  - tryout procedure, I: 207-208
  - types of tasks measured, I: 164-165
  - validation and revision, I: 205-209
- Job Performance Test (JPT), I: 158
- Jury-of-Experts, I: 39-40, 41, 67

- Knowledge of results (KOR), III: 31, 32, 33, 48, 51

- Learning activities, *see* Learning events/activities, specifying
- Learning analysis, II: 18-30
  - attitude category, II: 28-30
  - information category, II: 23-26
  - mental skills category, II: 19-23
  - physical skills category, II: 26-28
- Learning categories and sub-categories, II: 16-17, III: 11-17
- Learning events/activities, specifying, III: 1-105
  - classification of learning objectives, III: 10-17
  - conditions (active vs. passive), III: 4-5
  - cues or prompts, III: 6-8
  - directions for, III: 24-26
  - feedback, III: 6, 9-10
  - flowcharts (algorithms), III: 18, 20, 71-104
  - guidelines for eleven sub-categories of learning, III: 17-18, 35-70
  - learning categories with sub-categories, III: 11-17
  - learning guidelines (general), III: 3-6
  - outputs, III: 26
  - procedures, III: 3-26
  - purposes, III: 1-3
- Learning guidelines, functions of, III: 1-4, 208-213
  - general, III: 3-6, 10
  - specific, for eleven learning sub-categories, III: 17-20, 35-70
  - sub-category 1: rule-learning and using, III: 35-37, 71-73
  - sub-category 2: classifying, III: 38-40, 74-75
  - sub-category 3: identifying symbols, III: 41-42, 76-77
  - sub-category 4: detecting, III: 43-45, 78-82
  - sub-category 5: making decisions, III: 46-48, 83-86
  - sub-category 6: recalling bodies of knowledge, III: 49-52, 87-90
  - sub-category 7: performing gross motor skills, III: 53-55, 91-93
  - sub-category 8: steering and guiding, III: 56-57, 94-95
  - sub-category 9: positioning movement, III: 58-62, 96-99

Learning guidelines (*continued*)
  sub-category 10: voice communicating, III: 63-65, 100-102
  sub-category 11: attitude learning, III: 66-70, 103-104
Learning objectives (LO), II: 1, 4-5, 8-30, *see also* Objectives,
  common-factor, II: 90-92
  testing, II: 36, 38, 39, 42-45, 49-50, 64
Learning Objective Analysis Worksheet, II: 7; III: 27, 109, 224-225
Learning objectives, sequencing and structuring, *see* Sequence and structure of learning objectives, determining
Learning Resource Centers (LRCs), III: 141
Learning steps (LSs), II: 4, 5, 36, 38, 57

Management decisions, *see* Decisions, management
Management guidelines, III: 124-137
Management plan, *see* Instructional management plan and delivery system
Management plans, student, III: 185-196
  combination plans, III: 196
  computer-managed instruction, III: 191-194
  contingency-managed instruction, III: 187-189
  instructor-managed instruction, III: 186-187
  media-managed instruction, III: 194
  peer-managed instruction, III: 190-191
  student self-managed instruction, III: 195
Marginal students, guidelines for managing, III: 129-130
Materials, existing--review of, *see* Existing materials, review of
Matrices (for media selection), III: 113, 115-118, 172-184
Media, comparative costs, III: 112
Media (*continued*)
  decision matrices for selection of, III: 172-184
  evaluation of, *see* Existing materials, review of
  revision, III: 206-208
  selection (for instructional management plan), III: 106-124, 172-184
Media-managed instruction, III: 194
Media specialist (production personnel), III: 227
Military Occupational Specialties (MOS), I: 3, 8
Misclassifications, in testing, II: 52-55
Mnemonics, III: 31, 36, 41, 50, 59

Non-equipment-oriented jobs, I: 79-81

Objectives, development of, II: 1-34
  action statement, II: 5-12
  conditions statement, II: 5-6, 9-10, 13-14
  criteria for Terminal Learning Objective and Learning Objective statements, II: 8-16
  inputs, II: 1-2
  Job Performance Measures in, II: 2
  learning analysis for each Terminal Learning Objective, II: 18-30
  learning analysis: attitude category, II: 28-30
  learning analysis: information category, II: 23-26
  learning analysis: mental skills category, II: 19-23
  learning analysis: physical skills category, II: 26-28
  learning categories, II: 16-17
  learning objectives (LOs), II: 4-5, 8-30
  learning steps (LSs), II: 4-5
  outputs, II: 30
  procedures, II: 6-30
  standards statement, II: 5-6, 9-10, 14-16

Task selection (continued)
  data assessing and decision-making for, I: 139-148
  data collection for, I: 134-136
  data consolidation for, I: 136-139
  management constraints, I: 143-144
  outputs, I: 117, 148-149
  procedures, I: 117-148
  rationale for, I: 115-117
  survey sources, I: 133-134
Television producer (production personnel), III: 229
Television program production, III: 244
Terminal learning objectives (TLOs), II: 1-31
  action statement of, II: 5-12
  conditions statement of, II: 5-6, 9-10, 13-14
  guidelines for learner, III: 4
  learning analysis for, II: 18-30
  learning categories, II: 16-17
  standards statement of, II: 5-6, 9-10, 14-16
Test development, II: 35-61
  attitudes testing, II: 45-46
  information testing, II: 42-44
  inputs, II: 7
  mental skills testing, II: 39-42
  misclassifications, II: 50-52
  outputs, II: 37, 60
  physical skills testing, II: 44-45
  procedures, II: 38-60
  purposes, II: 35
  rank-order testing, II: 52-55
  scoring, II: 55-56
  standards, II: 47-50
  types of tests, II: 35, 38-39
Testing constraints in Job Performance Measures, I: 166-177
Trainer Appraisal Kit (TAK), IV: 7-12
Trainer Development Program (TRADEP), IV: 9
Training Extension Course (TEC), Army, III: 141-142
Training programs, selection of tasks for, I: 114-133, 139-148
Training task categories, see Learning categories

Trial report (small group), example, III: 340-345

Voice communicating: learning subcategory 10, III: 63-65, 100-102

Writer (production personnel), III: 229